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How Does J.D. Power Achieve the Highest Level of Accuracy for Understanding Consumers Online?

A J.D. Power and Associates White Paper

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J.D. Power and Associates Teams with NetBase to Optimize Social Media Research

As an independent source of marketing information, J.D. Power and Associates has helped companies and organizations around the world improve their products and services for more than four decades by providing the tools and actionable information they need to deepen customer loyalty and increase retention in order to become—and remain—profitable. In 2008, J.D. Power entered the social media research market, and has continually refined its capabilities for helping clients understand and better leverage social media. This experience, combined with the company's unique research processes and industry expertise, provides clients with a competitive edge in effectively integrating social media research into their businesses.

J.D. Power and Associates and NetBase have teamed to enhance the company's social media research. NetBase's patent-pending natural language processing technology, combined with J.D. Power's industry expertise, provide deeper insights that unleash the strategic power of social media. The unique capabilities of J.D. Power and NetBase result in a superior collaborative solution for understanding consumers. Using this joint solution, companies can understand what is being said about their organization, who is saying it, how it compares with their competition, and what they should do about it.

The Optimal Social Media Opportunity: Understanding Consumers Online

At an increasing rate, marketers, planners and researchers are looking to social media as a source for validating their traditional consumer insight programs and finding new opportunities to increase growth and market share. Social media research allows companies to analyze large volumes of conversation at a lower level of investment and with faster turnarounds. Most importantly, what consumers say in social media is not prompted or aided. Social media research is based on the unprompted, unfiltered, and unaided conversations occurring in consumers' "natural habitats" online.

The social media universe is growing at an astonishing rate. According to Harris Interactive, almost two-thirds of US online consumers now use social media.[1] Facebook reports that their average user creates 90 pieces of content each month.[2] NetBase research shows that up to 80% of consumers report that they do online research before purchasing certain consumer electronics products.[3] Every hour, the natural language processing (NLP) engine, powered by NetBase, finds and indexes 500,000+ blog entries, status updates, forum comments, and news articles posted by consumers.[4] With this volume of data available, those companies that are able to break through the noise to truly understand their target consumers have unique opportunities to:

- Optimize their messaging, advertising, and packaging
- Identify hot topics, market trends, and unmet consumer needs
- Measure and monitor their social media brand equity in real time
- Make more impactful strategic business decisions

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[1] *http://www.harrisinteractive.com/NewsRoom/HarrisPolls/tabid/447/mid/1508/articleId/403/ctl/ReadCustom%20Default/Default.aspx*

[2] *http://www.facebook.com/press/info.php?statistics*

[3] *NetBase data*

[4] *NetBase data*

Where Is Social Media Analysis Today?

To date, companies have used social media data primarily to monitor the quantity of conversations about their brand ("buzz") and to get a quick read on sentiment—that is, whether online posts are positive, negative, or neutral. While useful in concept, automated sentiment analysis has been plagued by questions of data quality[5] because the accuracy of the first generation of technologies has been low—less than 50% by most estimates. In other words, traditional automated sentiment analysis tools incorrectly interpret the content of an online post nearly half the time—for example, interpreting that a negative is a positive or a positive is a neutral.

To effectively evaluate the strategic value of social media data, companies need answers to three key questions:

- Is sentiment a useful measure to capture from social media?
- How accurate is the machine-scored analysis on which sentiment data relies?
- What actionable information may be extracted from social media other than sentiment?

This white paper provides insights into these questions. The paper discusses the challenges of accurately measuring consumer opinions; explores the type of insights that social media analysis may provide above and beyond sentiment; and describes how the highest level of accuracy in the market for sentiment analysis is achieved.

"First-generation solutions for automated sentiment analysis are typically based on some form of statistical keyword-matching, where the technology looks for the occurrence of predetermined positive and negative, or "good" and "bad," words in relation to the brand being tracked."

Accurate Sentiment Analysis Reveals Social Brand Health

Sentiment analysis focuses on the content of online posts, identifying whether they are positive, negative, or neutral, and aggregating the sentiments detected into a single generic score. Sentiment analysis can serve as a practical, cost-effective way to track general brand health over time, assuming the client has a way to measure sentiment accurately.

What Makes Sentiment Analysis Inaccurate?

On the surface, it may seem that sentiment analysis is easy to achieve. However, two factors have undermined automated efforts to date:

- The complexity of language itself
- The volume and variety of social media content on the Internet

First-generation solutions for automated sentiment analysis are typically based on some form of statistical keyword-matching, where the technology looks for the occurrence of predetermined positive and negative, or "good" and "bad," words in relation to the brand being tracked. The problem with this approach is that understanding language is much more complex than simply looking for the presence of positive or negative words, which is why most studies show that keyword-matching is inaccurate more than 50% of the time. Even the newer natural language processing technologies must analyze content at a very deep level to be able to accurately infer sentiment.

To understand language, a technology must be able to account for the fact that meaning can change, depending on the context in which a word is used. The technology needs to look not just at the word itself, but also at the connective wording surrounding it in the sentence. For example, "The iPhone has never been good" is actually a negative statement, despite the fact that it uses the word "good." A nearly identical sentence, "The iPhone has never been *this* good," is positive. In yet another example, "I like using my iPhone, but I hate the way that applications work on the Droid," the words "iPhone" and "hate" occur close together but are not associated with each other.

[5] *Forrester Research, "Trends 2010: Listening Platforms, Findings From Forrester's Listening Platforms Wave™ Evaluation," September 2010*

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One Small Word Makes a Big Difference

Furthermore, accurate sentiment analysis requires a new kind of scalability. A technology must be able to process billions of sentences, and it must also be able to address millions of variations in expression within those billions of sentences. For example, the type of language consumers use in tweets is different from that used in status updates or reviews. Bloggers tend to use much richer language than contributors to other types of social media. Many social media posts are full of mis-spellings, poor grammar, colloquialisms, forum-specific acronyms, and rapidly evolving "slanguage" or "urban words." A technology that cannot take all of this variation into account will either work only for a limited set of content types, or it will miss the accuracy mark altogether.

> ***"A technology must be able to process billions of sentences, and it must also be able to address millions of variations in expression within those billions of sentences."***

Achieving a Higher Level of Accuracy

A state- of- the- art NLP engine, powered by NetBase, delivers a significant leap forward in J.D. Power and Associates' ability to accurately analyze content from the social media universe. The NLP engine is nearly 90% accurate in determining not only sentiment, but also deeper insights such as opinions and emotions. Additionally, the NLP engine utilizes an in-depth approach to understanding language and is highly scalable. Clients can access an extensive, always-on index containing 12 months of social media content and obtain insights in seconds, on an unlimited number of brands, and with no setup or professional services required.

The NLP engine does not count words or analyze text, but rather reads sentences, evaluates grammatical sentence patterns, and organizes results to be fully searchable on a wide variety of attributes. The NLP engine analyzes social media content in two steps: *parsing* and *normalization*.

First, the NLP engine *parses* each sentence captured from social media at a deep level. This process is similar to the sentence diagramming that students might do in an English class—identifying and linking the subjects, objects, verbs, adjectives, and other linguistic patterns in the sentence—to extract a profound and accurate understanding of what is being said. By analyzing the connective wording, or context, within each sentence, the NLP engine can account for the complexities in language that make keyword-matching algorithms inaccurate.

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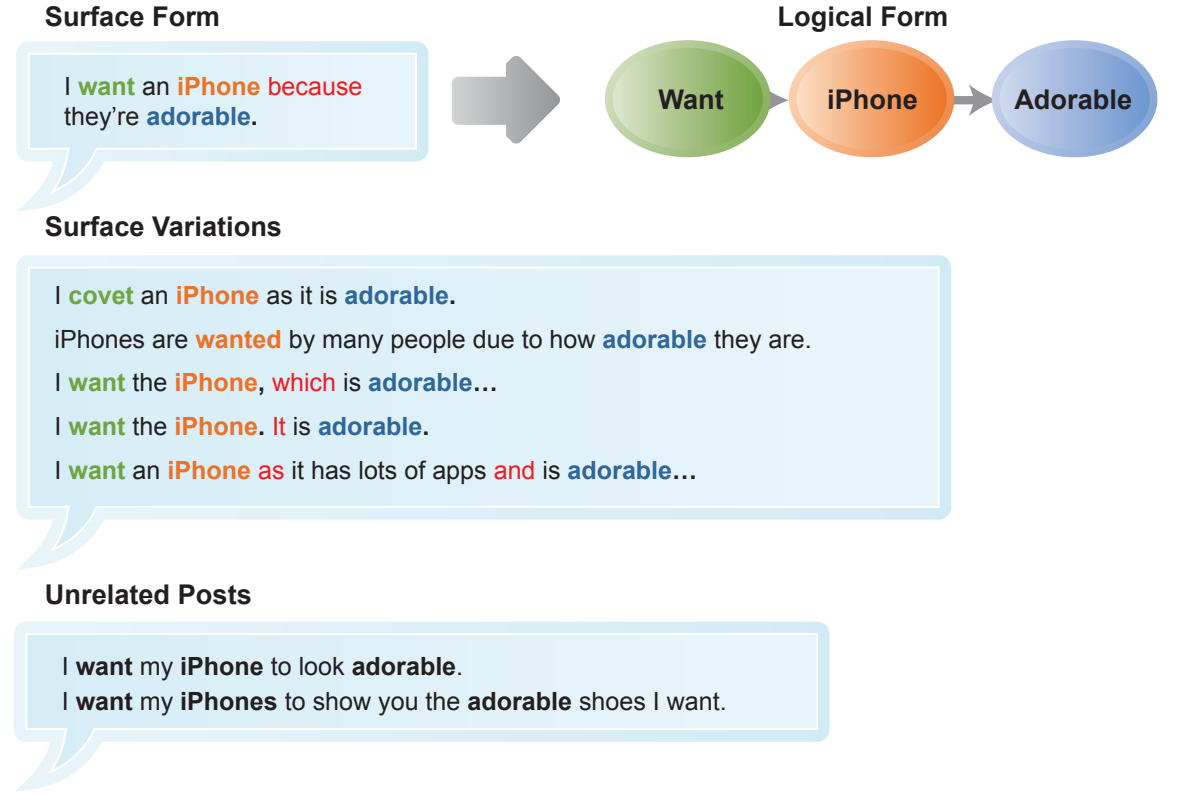
Analyzing the "Connective Tissue" of a Sentence



Next, the NLP engine *normalizes* all the parsed sentences to make them easy to search. It stores sentences (referred to as "sound bites"), based on the type of insight they reveal, which is done in a single, consistent format, regardless of the structure of each underlying sentence. This allows the NLP engine to instantly display insights that meet a designated set of search criteria without re-indexing them or re-parsing them. Normalization is a fundamental part of the NLP engine's unique value because it displays not only positives and negatives, but also deeper-level insights embedded within the content such as likes, dislikes, emotions, behaviors, preferences, etc.

For example, the brand manager for a given car model wants to understand what consumers like and dislike about this model. Utilizing the NLP engine, the manager can see what percentage of consumers like or dislike the styling, colors, handling, safety features, pricing, and much more, and can compare these social metrics across competing brands.

The NLP engine is powered by NetBase, the only company with a massive repository of more than nine billion sound bites of pre-parsed social media content that is searchable in real time. This index uses an efficient, scalable database that allows users to get results in a matter of seconds and quickly drill down to the level of individual posts. The NLP engine parses and stores huge volumes of additional new content on a daily basis.

NetBase, which works with many of the strongest brands in the world, has optimized the NLP engine to specifically understand social media. In addition to utilizing standard English, the engine's extensive lexicon includes a wide variety of urban words and phrases, alternative spellings, and abbreviations common in social media, as well as common misspellings. NetBase constantly incorporates new rules into this lexicon, based on the work of internal linguistics experts, ongoing testing done using "crowdsourced" human evaluators (described later in this white paper), and feedback from customers. Because NetBase develops its products using 2-week release cycles, the NLP engine adapts very rapidly to changes in language used by online consumers.

Beyond Sentiment Analysis: Positives and Negatives Are Just One Way of Analyzing Social Media

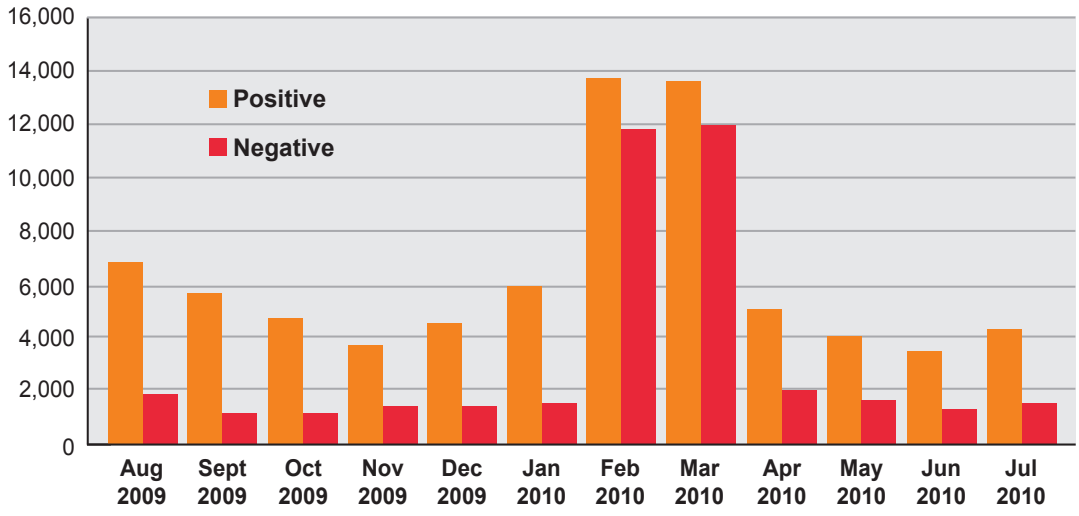
The NLP engine makes it possible to accurately read and understand billions of social media sound bites. However, positive and negative sentiment is just one way of measuring social media. There are other measures of consumer insights beyond sentiment: opinion, emotion, and behavior. The real question that many decision-makers ask is, *Why* do consumers think and feel as they do? J.D. Power and Associates not only provides trustworthy sentiment data, but also provides clients with the ability to answer this critical question.

Many J.D. Power clients view sentiment analysis as just the first step toward a deeper level of understanding consumer behavior. It is a departure point from which they dig down into the underlying opinions, emotions, and behaviors expressed in the comments that the NLP engine classifies and stores.

To illustrate the capabilities of the NLP engine, consider the case of a large CPG company that used a number of automated online listening tools to monitor and understand an emerging issue in its customer base. While the aggregate sentiment metrics provided some insights into the severity of the issue, the manufacturer needed to move beyond sentiment to take action. Using the NetBase NLP engine, the manufacturer analyzed the opinions and emotions expressed in both positive and negative posts, was able to understand the underlying consumer motivators and rapidly craft a response strategy.

Another example provides further illustration of the importance of a more in-depth understanding. Even in situations where negative sentiment surges, it is common for positive sentiment to surge as well, driven by "loyalists" who sing the praises of their brand in the face of adversity. In an independent analysis, NetBase used the NLP engine to look at chatter regarding the Toyota Prius during a period in early 2010 when Toyota Motor Corporation was facing a firestorm of media criticism for the tendency of the accelerator pedal to stick and for its braking problems.[6] During this same period, loyal Prius owners were filling the Web-based social media platforms with postings that expressed their love and passion for their vehicles. Looking at sentiment alone would not have told the whole story of consumers' feelings—positive and negative—regarding this issue.

Volume of Consumer Sound Bites About Toyota Prius



Source: NetBase social media analysis on Toyota Prius. (August 2009-May 2010)

[6] *Unless otherwise stated, all brand examples are based on publicly available Internet and social media content and do not reflect the usage or opinions of owners of the respective products.*

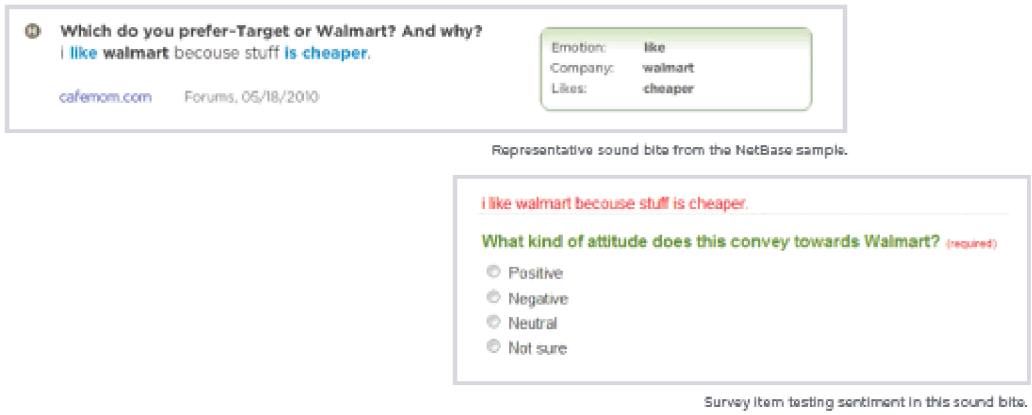
To get the whole story, it is necessary to also interpret sentiment. In its independent analysis, NetBase posed a hypothetical scenario, based on previous customer experience, to identify what next steps Toyota likely would want to take, utilizing the NLP engine. The automaker would likely want to research what the specifics are beneath the negative sentiments and determine how opinions regarding predetermined words, such as "expensive" and "ugly," compare with opinions about "brake problems" or "accelerator." The company's brand managers might want to use the NLP engine to track how specific consumer-reported behaviors have changed over time, such as "buy" vs. "not buy." They might also want to measure consumers' passion regarding the Prius during a given time frame around the February-March 2010 recall, or between then and now: Do they say they "love" it? "Like" it? "Don't trust" it?

When evaluating the accuracy of engines and tools for social media analysis, it is important to look not only at the accuracy of sentiment analysis, but also at the ability to accurately aggregate and organize data for more levels of analysis than just "positive" and "negative."

How Accurate Is NLP Sentiment Analysis?

The NLP engine provides significant advantages in accuracy, compared with traditional sentiment analysis tools because NetBase tests its accuracy on an ongoing basis. In addition to internal testing, NetBase conducts accuracy studies that compare a selection of results to similar assessments conducted by humans. The most recent NetBase accuracy study, conducted between August 23 and September 3, 2010, showed accuracy between 87% and 99% for the four different types of insights delivered: sentiments, likes and dislikes, emotions, and behaviors.

For this accuracy study, a sample was constructed of 2,500 results (referred to as sound bites), which were retrieved from the NLP engine for five products: the Apple iPhone, Chevrolet Camaro, Taco Bell, Walmart, and fish oil. A survey was then created that asked human evaluators to assess the accuracy of the engine's categorization of the sentiments, likes and dislikes, emotions, and behaviors being expressed by reviewing the sound bites and reporting what they believed the authors' opinions to be.



Source: Representative sound bite from the NetBase sample.
Survey item testing sentiment in this sound bite.

A small percentage of the survey items were deemed to be "gold items", meaning that a correct answer was encoded to test the reliability of the evaluators.

Finally, "crowdsourced" workers located in the United States were recruited to serve as evaluators for an online survey. When they agree to participate in a project, such as a NetBase accuracy study, these workers are not provided with advance knowledge of the purpose of the survey and therefore are able to provide unbiased opinions.

The workers could choose to complete as many items in the online survey as they wished, provided they were able to answer the gold items correctly. Gold items were automatically shown frequently toward the beginning of the task and less frequently thereafter. When a worker got a gold item wrong, the survey alerted the worker to the correct answer, providing feedback and training on the task. If a worker got fewer than 60% of gold items correct, their judgments were not collected. The survey remained online until at least three workers had provided a judgment for each sound bite being tested.

Because the survey data included high-precision results, the crowdsourced workers agreed on what was being expressed in the majority of sound bites. In cases where they did not agree among themselves, the sound bites were eliminated from the analysis.

The study resulted in the following accuracy levels:

Type of Result	Accuracy Measured
Sentiment (positive or negative)	**87%**
Likes and Dislikes	**87%**
Behaviors	**91%**
Emotions	**99%**

Source: September 2010 Netbase Accuracy Study

Conclusion

Automated language understanding will never be 100% accurate, even when utilizing the best technologies, and there will always be some limitations. For example, sarcasm is often difficult for even the most sophisticated NLP algorithms to identify (many humans also have problems interpreting sarcasm for similar reasons). Nonetheless, the near-90% accuracy that the NLP engine delivers is a groundbreaking innovation—for the first time ever, companies may use social media analysis not only to measure buzz, but also to drive better strategic business decisions.

The following are three key recommendations for companies considering investigating sentiment analysis and other ways to leverage social media:

- **Make sure you select the smartest possible social media analysis engines and tools.** You should know the accuracy of the data that drives your decisions, and you should look for solutions that provide you with the most effective results. J.D. Power and Associates delivers the highest accuracy possible in the market utilizing the NLP engine, which is powered by NetBase. NetBase continually improves the accuracy of the engine and makes it transparent through studies such as the one described above, so that clients are assured they can rely on the data to make effective strategic business decisions.
- **Look beyond sentiment.** The real value of social media analysis is in surfacing actionable insights, not just in generating metrics. Sentiment is important, but going beyond sentiment is what will make online listening part of the fabric of your organization.
- **Consider the value that accurate social media analysis can provide throughout your organization:**
  - — The ability for brand management and marketing professionals to track social brand health and to help improve messaging, packaging, and strategic decision-making
  - — Market research professionals' ability to conduct quick social media market research, or "netnography," or take a "fast first look" prior to starting a lengthy or expensive market research study
  - — Product development professionals' ability to track competitors and find new product ideas
  - — Insight that allows advertising professionals to improve ad targeting, refine ad copy, and track ad effectiveness

— Public relations professionals' ability to augment social listening strategies by spot-checking issues for deeper understanding and historical trending

— Sales representatives' ability to tailor their communications to real issues that their prospects face

— Data that allows customer service teams to uncover new product issues through online chatter, track the importance of issues, and improve support activities

About J.D. Power and Associates

Headquartered in Westlake Village, California, J.D. Power and Associates is a global marketing information services company operating in key business sectors including market research, forecasting, performance improvement, Web intelligence and customer satisfaction. The company's quality and satisfaction measurements are based on responses from millions of consumers annually. J.D. Power and Associates is a business unit of The McGraw-Hill Companies, Inc.

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About NetBase

NetBase provides engines and tools for understanding consumer opinions, emotions, and behaviors as expressed in social media on the Web. Their state-of-the-art natural language processing (NLP) engine reads billions of conversations from more than 75 million social media sources. It automatically organizes up to one year of brand-related chatter to determine not only sentiment but also deep, actionable insights. The NetBase NLP engine is nearly 90% accurate, so customers have the trusted information they need to make better business decisions. Customers such as Coca-Cola and Procter and Gamble turn to NetBase because their engines and tools are smarter, faster, and cheaper than any alternative on the market. Based in the heart of Silicon Valley, California, NetBase is a privately held company. For more information, visit: www.netbase.com.

About J.D. Power and Associates

J.D. Power and Associates is a global marketing information services company operating in key business sectors across a variety of industries, including market research, automotive forecasting, performance improvement, Web intelligence, and customer satisfaction. Established in 1968, the company has been listening to consumers and business customers; analyzing their opinions and perceptions; and refining research techniques and study methodologies to offer some of the most advanced product quality, customer satisfaction, and tracking research available today. The company's quality and satisfaction measurements are based on responses from millions of consumers annually. J.D. Power and Associates is a business unit of The McGraw-Hill Companies.

J.D. Power and Associates Services

Custom Research

J.D. Power and Associates conducts customized research and customer satisfaction measurement and tracking on a proprietary basis utilizing a variety of data collection methods. These studies give clients access to weekly, monthly, or quarterly data on demand, via a customized extranet,to identify issues and enable quality and customer satisfaction process improvements. J.D. Power has been conducting proprietary research in the areas of quality and customer satisfaction for more than 4 decades. *To learn more about our products and services, please visit: businesscenter.jdpower.com*

Automotive Forecasting

The J.D. Power Automotive Forecasting team is comprised of statisticians, economists, and experts in demographics who combine their knowledge of consumer behavior with the latest statistical modeling techniques to measure and track the global automotive industry. The team leverages its consumer and forecasting databases to predict sales, production, powertrain configurations, demand for future technologies, product cycle plans, and trends in vehicle prices and contenting. *To learn more about Automotive Forecasting, please visit: jdpower.com/forecasting*

Mystery Shopping

J.D. Power and Associates' mystery shopping programs evaluate how consistently employees communicate their company's mission, vision, values, and brand promise, primarily through measuring sales and service process execution. To measure consistency across the customer experience, J.D. Power deploys mystery shoppers to assess their employees' performance across a range of identified customer touch points. This provides objective, highly actionable and tactical information that allows organizations to compare their performance with key competitors, better understand operational strengths and weaknesses, and develop strategies for improvements. *To learn more about mystery shopping programs, please visit: jdpower.com/mysteryshopping*

Power Information Network® (PIN)

The Power Information Network (PIN) provides clients across Canada and the United States with real-time automotive information, analysis, and decision-support tools to reduce risk exposure, improve marketing and remarketing effectiveness, and increase profitability. PIN automotive solutions are based on the collection and analysis of daily new- and used-vehicle retail transaction data. Details from these transactions are evaluated to create products that focus on key measures, including price, cost, profit, finance, lease, and trade-in values. *To learn more about PIN, please call 800.947.6988 or e-mail customersupport@powerinfonet.com or visit: jdpower.com/PIN*

Certification Programs

J.D. Power and Associates certification programs help consumers and B2B customers identify product and service providers that deliver an outstanding customer experience. To become certified, the client company must meet or exceed the customer satisfaction benchmark established by the most recent J.D. Power and Associates research study in that industry. Companies that become certified may then have the opportunity to license the J.D. Power brand to enhance consumer recognition of their certification. *To learn more about these certification programs, please visit: jdpower.com/certificationprograms*

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