

ID# CU136

PUBLISHED ON
AUGUST 26, 2014

Generating Perceptual Maps from Social Media Data

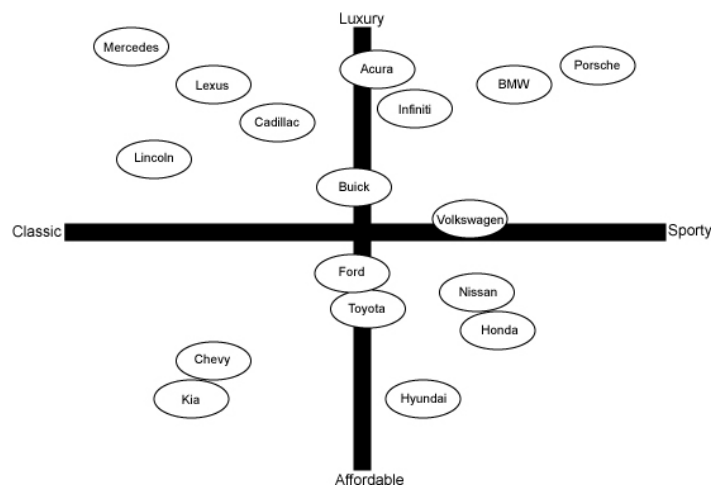
BY ODED NETZER*

Defining Perceptual Maps

A perceptual map or a market structure map is a plot that places several products or brands on a multidimensional space, often relative to product features or characteristics. Such maps can help executives spot threats—as well as gaps and opportunities—in the competitive landscape. They can also help them listen in on what consumers love, hate, and desire from products. These maps have long promised to illuminate critical positioning questions by capturing consumers' attitudes about a brand relative to comparable brands and products.¹

Take, for instance, the map in Figure 1 plotting car brands, developed for the purposes of this case. It is classically organized along two axes, each representing a spectrum of attributes that consumers use to describe car brands. The companies in turn are plotted in space to reflect how closely consumers associate them with these dimensions.

FIGURE 1. PERCEPTUAL MAP OF CAR BRANDS



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Acknowledgments

Jacob Levenson provided research and writing support for this case.

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The appeal of such a map is obvious. From just a glance at it, brand managers at BMW could learn that consumers believe that BMW's cars are classy, distinctive, and sporty. What's more, they could see that BMW is competing with Porsche for customers who desire those qualities in a car. They could even deduce that Infiniti is lurking as a threat in the distance.

Maps like this can be created to describe consumer perceptions of any number of brands and products. They are often straightforward two-axis plots, like the map shown in Figure 1. But they can also be made to include several axes that capture a more nuanced picture of consumers' perceptions by adding elements regarding consumers' attitudes or preferences for particular product features. It is also possible to include customer segments to match product perceptions with specific customer segments.

But how useful are these maps in practice? Not surprisingly, this depends strongly on the quality of the source information—and on the challenges inherent in gathering market intelligence on the elusive, messy, and ever-changing universe of how consumers feel about brands and products.

The Data Dilemma

Companies have long struggled to get a handle on how consumers feel about brands and products in real time. Veteran marketing professional and CBS alum Wendy Balter, a former vice president/account manager for high-profile consumer package goods at Grey Advertising, offers insights about this question.² According to Balter, surveys and focus groups are the gold standard for gathering this type of information. But they are expensive to conduct and yield data that is riddled with potential problems. First, consumers' responses are necessarily confined to the survey questions. This limitation closes off entire avenues that could lead to potentially game-changing observations. Sample size is also an issue. Even a large-scale survey will reflect the views of only a fraction of the market. It's also next to impossible to find a class of respondents knowledgeable enough to compare the 20 or so brands necessary to map even a segment of a large sector like automobiles. Finally, consumers' loyalties are constantly changing, so survey data is often obsolete as soon as it's published.

Companies are aware of these problems and often take a short cut, assessing consumer attitudes by brainstorming among their own managers. The resulting maps may capture the received wisdom within the company walls, but they are hardly verifiable reflections of what consumers really think.

Enter Social Media

Firms have known for some time that eavesdropping on online forums, blogs, chat rooms, and product-review sites could theoretically provide direct access to consumer opinions. Indeed, the posts to these sites possess the exact qualities necessary for creating meaningful perceptual maps: the comments are produced voluntarily, provide a vast amount of data, and capture consumer attitudes in real time.

Yet firms have had difficulty figuring out how to harness this trove of information. The trouble has been that the very size, dynamism, and organic nature that makes social media so potentially valuable has also made it impractical to organize and measure. Furthermore, social media data is commonly textual and unstructured, making it difficult to analyze. Professor Oded Netzer of Columbia Business School, Jacob Goldenberg of Columbia Business School and the Interdisciplinary Center in Herzliya, and Ronen Feldman and Moshe Fresko of Hebrew University in Jerusalem have sought to solve this problem by joining text-mining technology with research in cognitive psychology to translate consumer opinion on social media sites into quantifiable—and mappable—data.³

Their method involves two stages. First, Netzer and his colleagues search product forums and text-mine every instance that consumers mention a brand, product, or descriptive attribute. Second, they look for the frequency with which consumers mention those key words in conjunction with one another. Here's where the cognitive psychology comes in. They know from research in the field that the more frequently people recall and write about brands or descriptive attributes together in a post, the more closely they associate those brands or attributes in their minds. Such co-mentions—which can be quantified and mapped—are therefore important indicators of consumers' attitudes. In a study of the consumer sedan forum at Edmunds.com, Netzer and his colleagues demonstrated how the method works.

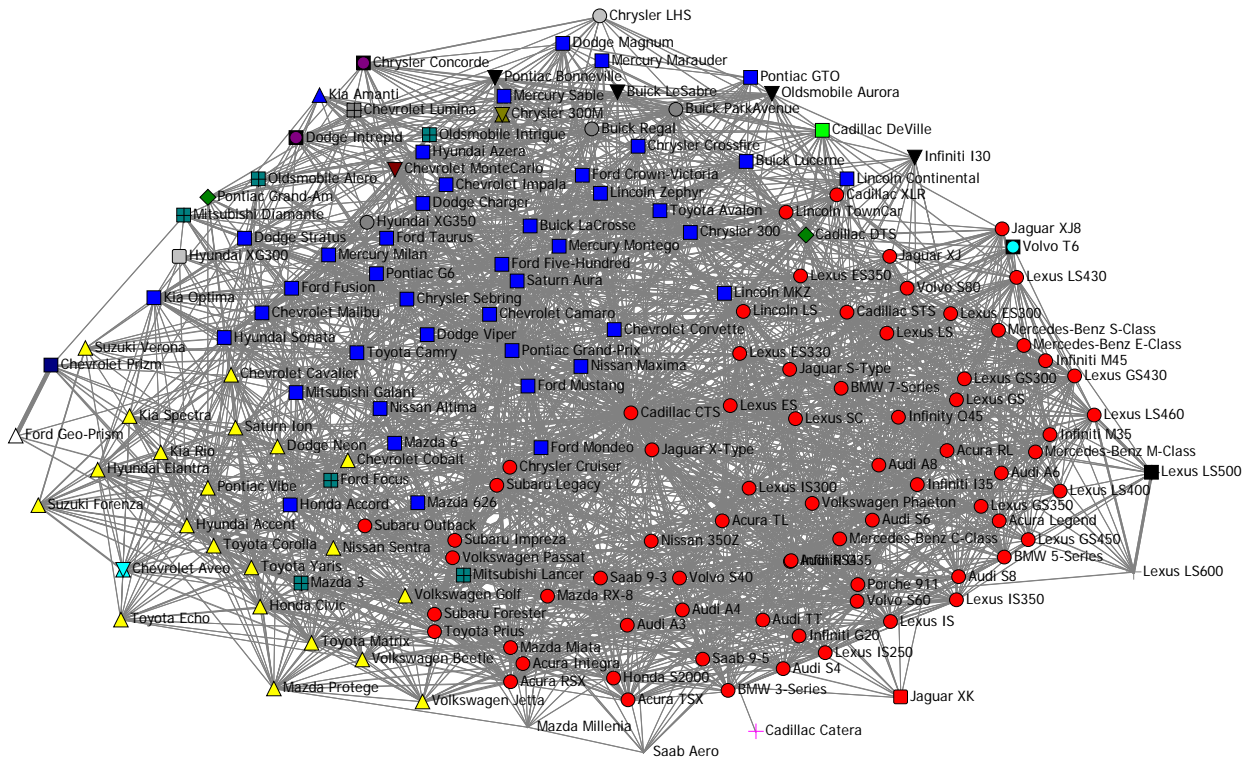
The Sedan Study

Netzer and his colleagues began their study by text-mining the forum for the period from 2001 to 2007 for mentions of brands, models, and attributes. During that time, 76,587 unique consumers posted 868,174 messages. Netzer and his colleagues used proprietary software to analyze this huge volume of data⁴ and extracted:

- 30 car brands, such as Honda and Toyota
- 169 car models, such as Honda Civic and Toyota Corolla
- 1,200 common phrases and terms people used to describe these cars, such as "compact," "safe," "hybrid," and "legroom"

Next they set about mapping the data. They were interested in how consumers associated car brands and models and what that information indicated about market structure. To that end, they first created a dataset of co-mentions of all 169 car models, generating a semantic map between brands; in the map, brands that were mentioned together more frequently in the forum's posts were located closer to one another and had stronger connections than brands which were mentioned together less frequently (see Figure 2). The map captured a comprehensive picture of the forum discussion.

FIGURE 2. CAR MODEL SEMANTIC NETWORK BASED ON TEXT-MINING EDMUNDS.COM FORUM DATA



Note: The map was created by Netzer and his colleagues using a UCINET network visualization tool.

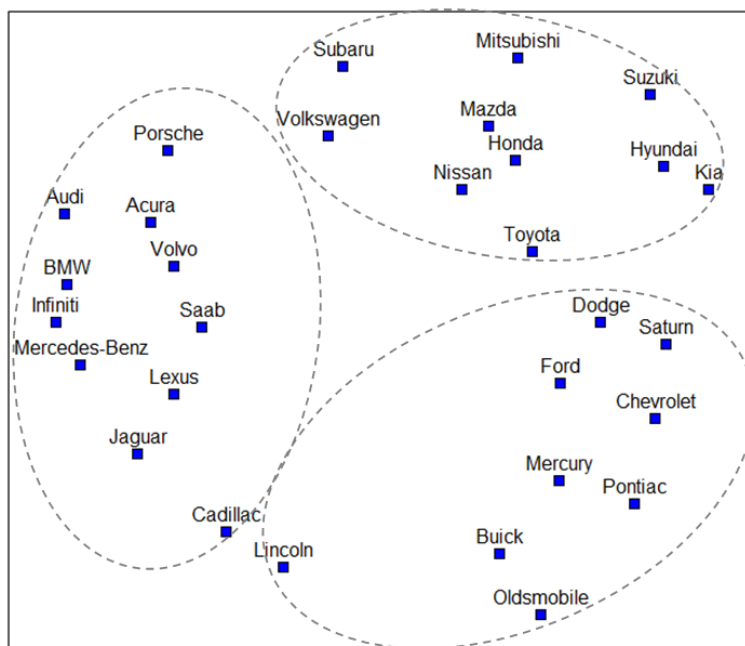
After the map was created, Netzer and his colleagues were able to further explore the market structure by looking for clusters of car models mentioned frequently with one another but less frequently with other groups of car models. This clustering provided high face validity, with each cluster predominantly consisting of cars from the same family. For instance, the car models in the bottom left region of the map—such as Toyota Echo and Suzuki Forenza—are the smallest sedan cars in the market. Moving to the right in the figure, the cars increase in size and luxuriousness, with the high-end Lexus models like the LS500 and LS600 located at the far edge of the map. Furthermore, cars of the same country of origin or the same make, like the Audi A3, S4, and TT, often appear close to each other. A host of insights can be gained from examining the location of different car models on this map.

All told, Netzer and his colleagues found 26 clusters, represented by colored nodes. This may seem like an unwieldy number for analysis. However, on closer examination, three large clusters become evident:

- Yellow triangles, which represent largely compact, economy-class cars like Toyota's Corolla, Echo, Matrix, and Yaris.
- Dark blue squares, which primarily represent family cars like the Toyota Camry and Avalon
- Red circles, which predominantly represent luxury cars like Lexus

To get a clearer picture of the market structure, Netzer and his colleagues aggregated the car models information to co-occurrence of car brands. Thirty car brands—a manageable number—were mentioned in the forum, which made it possible to draft a clearer and more intuitive map of the market structure (see Figure 3).

FIGURE 3. PERCEPTUAL MAPS OF CAR BRANDS BASED ON TEXT-MINING EDMUNDS.COM FORUM DATA



Note: The map was created by Netzer and his colleagues using UCINET multidimensional scaling analysis.

Several insights can be derived from Figure 3. Most American brands are clustered together in the bottom right section of the perceptual map. The left area is populated by high-end luxury European and Japanese brands, such as BMW, Infiniti, Audi, Acura, Mercedes-Benz, and Lexus. Mainstream Japanese brands, such as Honda, Toyota and Mazda, are located in the top portion of the map. The only American brands that are positioned somewhat close to the luxury import brands are Cadillac and Lincoln. In fact, Cadillac is the only American brand that belongs to the luxury cars cluster.⁵ It should also be noted that while the map in Figure 3 is static, it is also possible to create a dynamic map, updating data in real time.⁶

The map highlights several advantages of text-mining social media to determine consumer opinions. First, Netzer and his colleagues were able to simultaneously measure the discussions for 169 car models, which would be tremendously difficult and prohibitively expensive to do using traditional marketing research methods. Consumer forums like those found on Edmunds.com are living databases that can be used to track how consumer perceptions are changing over time. The co-mention data can be used to capture how consumers perceive brands both in relationship to each other and in relationship to specific attributes. Still, Netzer and his colleagues say that further research needs to be done to determine the ultimate potential—and limitations—of this method.

Questions for Discussion

1. What type of insights can be gained from maps such as the one in Figure 3?
2. What are the similarities and differences between market-structure maps based on data from consumer forums and more traditional approaches to modeling market structure?
3. Does the position of any brand in Figure 3 surprise you?
4. Based on the map in Figure 3, what recommendations would you make to the Volkswagen brand manager?
5. What might undermine the validity of using social media data to determine brand positions? How could those problems be overcome?
6. What other innovative sources of data might be used to create perceptual maps?

Endnotes

¹ Naresh K. Malhotra, *Marketing Research: An Applied Orientation* (Upper Saddle River, NJ: Prentice Hall, 2007), 663.

² All statements by Wendy Balter were made during a phone interview with case writer on August 15, 2014. At the writing of this case, Balter was president (phase five) at Grey Healthcare Group in New York, New York.

³ Oded Netzer, Jacob Goldenberg, Ronen Feldman, and Moshe Fresko, "Mine Your Own Business: Market Structure Assessment through Text Mining," *Marketing Science* 31, no. 3 (May–June 2012): 1–23. All subsequent references to this study are from this article, unless otherwise noted.

⁴ Though not to the same level of precision, one can use some freeware (e.g., Text Mining Infrastructure in R, RapidMiner, and Natural Language Toolkit [NLTK]) as well as some commercial tools (e.g., Lexalytics Text Analytics, Attensity, and SAS Text Analytics) to perform the text-mining task.

⁵ Netzer and colleagues verified the validity of the market-structure maps derived from the text-mining approach by comparing their results to market structures derived from brand-switching purchase data and from survey-based consideration set data.

⁶ See Oded Netzer, *Using Social Media Data to Track the Effectiveness of a Communications Campaign*, Columbia CaseWorks case #150502 (New York: Columbia University, 2014).