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ADVANCES IN MINING SOCIAL MEDIA: IMPLICATIONS FOR MARKETERS

DANIELLE FOWLER

UNIVERSITY OF BALTIMORE

dfowler@ubalt.edu

DENNIS PITTA

UNIVERSITY OF BALTIMORE

dpitta@ubalt.edu

ABSTRACT

Social media have reversed the traditional brand manager-to-consumer information flow. The increasing popularity of social media sites and apps has changed the nature of communication, allowing consumers to share brand information among themselves. As marketers have lost their traditional access and control over information considered necessary for successful brand management, in “hearing the voice of the customer”, they have simultaneously gained access to billions of unfiltered user comments and transactions, if the data can be made accessible. This paper explores the current state of “internet mining” technologies and tools, including text analytics and semantic web technologies, which can facilitate gathering data about the preferences and attitudes of consumers from user created media.

Keywords: Social media analytics, Brand Management, Semantic Web, Voice of the Customer

INTRODUCTION

Successful businesses base their strategies on a combination of their skills and resources, the competition, and market opportunities. Many market opportunities lie fundamentally with customers. Without customers, no profit-seeking business can survive. Even with customers, organizations need to know consumer wants in order to satisfy them, and thereby stave off competition and gain their business. Thus, learning what customers want, 'listening to their voice,' is critical. Much of the voice of the customer (VOC) literature is conceptual and based on the notion of customer focus which is important in creating business strategy [18]. The importance of focus is that it may contribute to an "ability to translate customer input..into hit products" [32]. Much of the VOC literature recognizes its importance in identifying unmet needs.

Furthermore, VOC provides a customer's-eye view to provide insight and ideas for product innovation [10].

In the past, learning what customers wanted, spawned the VOC movement and took the form of listening or collecting data at the points of contact. Some of those points of contact were physical. One example is the check-in counter at a hotel. Reception personnel were trained to ask for a guest's preferences, note them in his or her profile and attempt to satisfy them. Recording the data was an important step in one-to-one marketing, a trend which continues [25]. By laboriously collecting data, businesses could build profiles of preferences for individual customers and increase their ability to satisfy and retain them. The process is slow and benefits from information technology which allows national chains to store the data centrally for access by each unit. Thus, all of a hotel chain's locations could know a particular cus-

tomer's preferences for each of its services and be prepared to satisfy them.

While information technology has developed dramatically, customers have not only changed over time but have changed the nature and scope of brand management. Christodoulides [6] reported a shift in the brand manager - target customer relationship that has changed how brand managers do their jobs. Technological change, namely advances in the Internet and e-technologies, have reversed the control of information flow from the brand manager to the customer. Moreover, he reports a shift in the nature of online consumer interaction: "a more participative approach to branding." That shift has been termed nothing short of revolutionary [37]. It is the product of inexpensive personal computing devices, innovative personal communication devices, the worldwide spread of Internet infrastructure and a growing presence of young computer savvy consumers, the Millennials. There remain unanswered questions about how customers connected to social media will react to the brand management activities of practitioners. This paper explores the current state of the most promising categories of technological tools, including semantic tools and text analytics, which can gather data about the preferences and attitudes of customers from their online comments. These tools allow brand managers to formulate and refine communication strategy before investing in actual communication.

Social Media and the Consumer

The rapid penetration of broadband access and simple to use and inexpensive computers make it easy for even less technology savvy consumers to feel at home on the Internet. Social media, once the province of the young, are now even used by grandparents to keep in touch with their grandchildren. The result has been a sea change in how individuals live, work, shop and spend their leisure time [14, 29]. This change is felt in all areas of marketing, particularly brand management. Instead of traveling to a city to meet with people of similar interests, one can interact with consumers across the globe that comprise an online community. These online communities (once forum based but increasingly built around mobile technologies) are the locus of the power shift which has reversed the positions of consumers and brand managers. In actuality, consumers now have unprecedented power, forcing brand managers to adapt to the changing power dynamics [37]. Brand management aims to increase consumer participation in the fundamental stages of the brand building process. This has required a shift in role with the brand manager changing from "a 'guardian' of the brand ... (to).. more of a brand 'host'" [6].

The increase in scale of this change has been relatively recent. 2007 was the first time that people spend more time using the Internet than on reading print media [37]. Webb presents a practitioner's perspective and prescribes a course of action for brand managers. His advice includes the following points:

1. Emphasis on the importance of increased scrutiny of the customer and his or her media interaction preferences.
2. The importance of understanding the customer, his or her motivations, preferences, life style factors and anything else relevant to how the customer might interact with each other and the brand.
3. Interact with the customer, not only to know him or her better but to build a relationship that will transfer to the brand.

Increasingly this understanding is built on analysis of user created media, rather than point-of-contact data: tweets, facebook posts and forum messages, rather than surveys and customer service calls.

Listening to the Voice of the Customer

Modern marketers strive to listen to the voice of the customer to become more competitive and satisfy their audiences more effectively [21, 39]. Product development's effectiveness is directly linked to including voice of the customer information [7]. Similarly, building brand relationships and brand loyalty requires knowing what customers want, like, dislike and cannot abide [15,19, 33]. There is strong evidence of the need to assess the brand characteristics from the consumer's perspective using a variety of means [24]. Today it is especially important to monitor customer communications, especially online communication [12].

Voice of the Customer (VOC) research demonstrates that companies have a difficult time collecting, analyzing, and integrating the information in their operations [30]. Data gathering is another victim of the shift in the consumer-brand manager relationship. One of the brand manager's responsibilities is to take an existing product, craft its image, find it a place in the target consumer's life, and build a relationship between the customer and the brand. To be successful one needs to know what customers think of the existing product and its competition; what they need or want in terms of price, image, performance, or other characteristics; when they want it; and where they want it. As consumers have adopted social media and online communications, their beliefs, feelings and preferences have become more apparent. Simultaneously, it has become more difficult to use the traditional communication methods like surveys, focus groups, and

day in the life experiences to collect the data. The basic paradox of having more apparent consumer information which is less usable stems from the nature of social media and online communities. Whereas the quantity of data available is huge, the context is much less defined than in a setting such as a focus group, where specific data can be collected. Understanding tie-strength, for instance, is difficult to establish from social media data: users posting to the same thread could be total strangers or trusted friends, with no easy way to distinguish between them. Researchers such as Gilbert and Karaholios [16] have been working to create predictive models of tie-strength from social media, but this is just one of the areas in which mass, unstructured datasets are fundamentally different to the structured data most businesses have built their analysis processes around.

Given the clearly identifiable value of understanding such data to business, marketers and IT provid-

ers unsurprisingly have been amongst the fastest to recognize the value to be mined from the massive amounts of information being posted by consumers every day on social media sites. Customer Relationship Management (CRM) systems have grown in sophistication and reach, allowing companies to connect data from social media sources and link it to the data in their traditional systems. Whereas traditional CRM systems were developed to organize and keep track of all the points of “touch” on a customer, these Social CRM systems have a different focus: connecting the organization to their industry community.

As Social CRM systems become more sophisticated they enable a growing set of functions. Figure 1, for instance, showcases 18 distinct use cases (business activities) where insights from social media play a role. All of them have at least some importance to brand management, in addition to other marketing functions.



Figure 1: "Social CRM: The New Rules of Relationship Management" [36]

As companies have become more experienced with these systems their focus has shifted from simply monitoring what is happening – in real time – to using the data in more strategic ways. While broadly monitoring word of mouth online is still crucial, not every forum post is as relevant to a company as another. The posts of some consumers, “ influencers”, carry more weight than normal. The concept of Influencer Relationship Management (IRM) or influence mining is built around the idea of

identifying key influencers so that they can be given more attention. One focus is what they are saying. This can be done by monitoring their forum posts more closely. Another focus is treating them differently by improving the speed of a customer service response or number of follow-up contacts.

Online Consumer Forums

Online communities are an example of user created media that can be mined in order to create value for the firm and its customers. In several important ways online communities add value by building brand awareness and image, as well as providing access to the voice of loyal customers. Research has confirmed that online community commitment is a key influence on brand commitment and membership results in stronger brand commitment [23]. Thus, online consumer communities offer a potentially valuable source of insight into consumer perceptions of brands [27]. Moreover, they are accessible anonymously to companies whose employees become community members. However, these communities present a significant challenge to brand managers. Many brand managers were weaned on a diet of advertising: television, magazine and newspaper. The traditional media are withering among a host of new choices and the imperative is to attempt to regain the consumer's eyes and ears.

One of the byproducts of online consumer communities is the production of persistent consumer generated content. Data left on external internet sites such as blogs, forums, and review sites presents significant untapped potential for marketers. These sources offer current data on everything from user satisfaction with product performance to new uses for those products. Paradoxically, while there is more data, there is a scarcity of information useful for decision making. One reason for the untapped potential is the difficulty of making sense of the data. Communication in online communities is between humans and is designed for humans. Thus, although it is possible to access data from these sources, its usability has traditionally been limited by its nature: it is machine readable, but not machine understandable. Computers are valuable when they do a very specific task using highly specific instructions. In contrast, humans communicate in a relatively fuzzy manner which machines cannot easily analyze. This makes such analysis time consuming, resource intensive, and rudimentary. Then too, some posts are easier to understand than others.

Some of the desirable characteristics of online community forum posts [28]:

1. Conversational Richness. The nature of the communication between people engaged in social networking is generally more of an ongoing conversation between peers, than a single comment/ response. This means a more detailed or nuanced picture can be gleaned, particularly over time. Because the forum is not controlled by the manufacturer participants are giving real, self-directed, honest views.
2. Detail/Size. A forum post is not typically constrained by size limits, unlike a Tweet, an instant message, or a text message.
3. Lack of survey bias. Forum posts are typically free of the bias present in survey collection. The person isn't trying to answer based on a perceived want or concern, or image, at least not one to do with the company/researcher.
4. Longitudinal picture. A long running forum thread can show a change in a poster's opinion of a product over time. More important, the change is often linked to the reason for the change (e.g. "I took the forums advice and tried these settings on my plasma TV and decided not to take it back after all).
5. They are hosted on the web. Most forum sites are web pages, built on existing web technologies (particularly html). Current work to take the existing internet and "upgrade" it by adding semantic meaning to web documents offers hope of making it possible to gather structured, meaningful data from web sources.

Given their identifiable relevance to a particular product or brand, and the fact that a business can choose to interact with forum participants, or even host the community, online communities were one of the first types of social media to be focused on by marketers, after analyzing their own website traffic. Now, however, organizations have tools that let them collect and analyze data from all over the internet. From dominant social media sites like Facebook and Twitter and Youtube, to individual blogs and vlogs, to phone or tablet apps like Candy Crush or Foursquare, to "anonymous" search histories, to the quickly growing "internet of things," "big data" now includes information such as voice data you leave at a call center, the TV shows you watch with your DVR, the time you spend in online game or entertainment environments like Xbox live, all in addition to Clickstream data from web servers. This data is not tractable to conventional analytics, but for those organizations who understand them, enablers of new products and services and rapid organizational change [11]. The unprecedented reach and integration of such data lends strength to the argument of a "big data revolution" [34].

THE IMPACT OF BIG DATA: APPROACHES TO ANALYZING SOCIAL DATA

With this massive increase in data to be mined has come ever more powerful analytical tools and methods. The ability to physically scan the vast multitude of

blogs, online forum posts, Tweets, RSS feeds, Facebook posts etc on the Internet is a task that has now become economically feasible. Storage and processing power have become sufficiently inexpensive; cloud services allow organizations to purchase capacity without huge investments in infrastructure. Massive data sets can be compiled or purchased. Robust open source tools such as python, R, machine learning patterns, hadoop / MapReduce and D3 allow for (respectively) manipulating and cleaning data, statistical analysis, automation of common tasks, building data architectures for big data, and visualizing data. Examples of successful use of these tools are becoming common, as is the maturing of statistical models used to analyse the data. Google most famously was able to predict the movement of the Avian flu (H1N1) in 2009 better than the Centers for Disease Control, by testing many different predictive models over their massive search data until they found the best candidates [17]. Since then hearing stories of successes in diverse applications such as predicting manhole cover explosions in New York [31], or election results [34] have become commonplace.

Regardless of the specific type of social data being mined, or the designated use, systems that collect and analyze data from social media (particularly in real time) face a number of common issues, often known collectively as “the Vs”:

1. **Volume.** More data has been created in the last 3 years than the previous 40,000 combined. Beyond social or web data there is sensor data, big transaction data, biometrics and machine2machine data, amongst others. A single boeing engine produces 10 TB of data every 30 minutes; every day commercial flights in the US alone create over 1 petabyte of sensor data [20]. The need to analyze that data in real time (or close to it) leads to the second issue...
2. **Velocity.** The NY stock exchange generates 1TB of trade data daily. 400 million tweets are made daily. Speed in identifying relevant trending data is critical, either to identify opportunities or become aware of issues (for example, the Adidas “death star” viral ad campaign and how it went wrong in Japan).
3. **Variety.** Data comes from a multitude of sources, each with a (possibly proprietary) interface for downloading data. Often the data is unstructured. The knowledge management or data warehousing tools within the company that these data feeds need to be integrated into are traditionally designed to work on structured data.
4. **Veracity.** How much data on the internet is accurate? Estimates put it well below 20%, from

photoshopped online profile pictures to careless date attribution. The case of United Airlines shares dropping 75% overnight based on automated trade software incorrectly handling an old bankruptcy filing story illustrates the problem [13]. And that is the simple case of inaccurate or missing data (a date of publication, in this case).

Veracity is perhaps the most important issue for marketers and other business users. The first 3 “Vs” are soluble using technology. Veracity is more problematic because the problem can lie with semantic meaning missing from the very point of creation. Most social data is in natural language form (prose text), which causes issues with ambiguity, precision and parsimony, amongst others. There is nothing in a tweet, for instance, to tell a machine that “4108376625” is a phone number: it is simply text; possibly numeric.

Take the example of a simple online forum post. The launch of the 4G iPhone by Apple was a topic of much online discussion. In the months leading up to its release there was much speculation about the features of the upcoming phone. Close to its release date, details about a prototype left in a bar were leaked online and quickly went viral. Soon after the launch, which was very successful, concerns about an antenna problem were similarly spread widely and rapidly over the internet. In this case, Apple has a strong interest in understanding the immediate effect of these events on their brand, but also any long-term effects. This means all of those conversations are relevant to them, both now and in the future.

The “event” of the antenna issue, however, was not discussed only in threads conveniently called “iPhone antenna problem”. One of the prominent ongoing (“sticky”) threads on the iLounge within the iPhone area is called “The official iPhone discussion thread.” Created on January 9 2007, it contains (as of September 2013) 217 posts related to the iPhone, and seems to have died off in 2012. There are also at least 15 other apple related forum sites with the exact same thread name. While there are numerous topics a brand manager might be interested in that are discussed in that thread, the antenna issue is interestingly not mentioned at all. In fact, the issue is discussed mainly in a thread called “VAPOR 4 Case for iPhone 4”. Therefore, humans cannot keep up with identifying problems by simply reading the most general and most popular threads. It takes a web scan (scrape) of the entire forum to form a picture of all the conversations being discussed, and it takes analysis capable of understanding that “this better be fixed or I will be switching to Samsung” refers to a specific issue with a specific model phone, at a certain point of time, and that the poster is referring to their contract-renewal decision time frame.

There are two fundamental approaches to solving this semantic problem. The first is the one taken by various text analytics approaches (variously embodied in business intelligence, data mining, big data, data analytics functions): to work from the text given. The analysis is conducted post-hoc: that is, after the point of creation by the user. The other is to capture semantics at the point of creation, for example via semantic web technologies [1]. The most promising approaches mix them both.

Semantic tools have now evolved to help with the issues above: Thirunarayan and Sheth [38] outline how semantic models and technologies can, and are, being used to assist with the issues of *volume* (by enabling abstraction to achieve semantic scalability for decision making), *variety* (by overcoming syntactic and semantic heterogeneity to achieve semantic integration and interoperability), *velocity* (by enabling real time ranking and semantic filtering at the point of collection), and *veracity* (by cross checking multimodal sensor data with semantic constraints, and adding expressiveness and scope to current models).

USING THE FRUITS OF BIG DATA: PRIVACY AND SECURITY CONCERNS

Processing big data, particularly social media data, has matured to the point where predictive analysis can be very insightful. Target, for instance, was able to increase its sales of “maternity” products by over 30%, by using analytics to identify when a woman might be pregnant, or planning to be pregnant. While the project was successful, it also brought a backlash: customers unhappy that Target evidently knew more about their parenting plans than their family, for instance.

The mechanism individuals often assume will provide them privacy is anonymity, which is neither the same thing as privacy, nor something that can be guaranteed when dealing with online information. This is not a new phenomenon, but as users are exposed to more examples of how privacy is difficult to maintain over the internet their tolerance may drop. Notable cases include that of AOL and Netflix. In the AOL case, 20 million search queries from over 650,000 users were released for researchers to analyze. The data had been stripped of identifying marks such as IP addresses and user names, and yet the NY Times took only days to identify user 4417749 as Thelma Arnold, a 62 year old widow from Lilburn, Georgia. The Netflix case was similar: in 2006 they released 100 million rental records from half a million customers as part of a competition to crowdsource an improved film recommendation system. Again, a user was

identified; a mother and closeted lesbian in the US Midwest, who subsequently sued Netflix. Researchers discovered later that the identity had been re-identified by connecting the search data with other public information, specifically by matching a rating profile to the internet movie database (IMDb.com). The research demonstrated that rating just 6 obscure movies out of the top 500 could identify a Netflix user 84% of the time [22].

These cases are notable for their age: 2006 is an age away in internet terms. Facebook (which barely existed in 2006) now generates 130 terrabytes in data per day in logs (another 400 terrabytes in images); Yahoo runs 42,000 hadoop nodes to cope with 200 petabytes of data; Twitter sees 1 billion tweets weekly. Recent news stories about the US government suggests it also collects masses of data: the NSA is reputed to store 1.6 billion emails / phone calls a day, and makes its data available to US agencies such as the DEA and IRS. The FCC alone has 400 different registered data collection initiatives.

With this scale of data collection and analysis comes the issue of whether current privacy solutions work, and how businesses should implement them so as to minimize customer concern. Howard et al. [22] argue that size matters— that existing privacy solutions such as “notice and consent” work when the potential use of the data collected is known, but that this is rarely the case with big data – it is important precisely because it reveals uses / solutions / products not yet identified. Google can hardly contact millions of search users (if they could find them, itself a task violating their privacy) to ask them retroactively for permission to use their search histories in predicting the next flu outbreak. Asking users to agree to any possible future use of data at the time of collection is similarly problematic. While organizations can point to things like their data governance policies (which often use concepts like the responsibility matrix of “Responsible, Accountable, Consulted and Informed (RACI)”), this is still an untested area.

If privacy is one of the concerns in mining big data the problem might be solved simply. Over time, consumers' expectation of privacy have diminished. The current group of technology knowledgeable consumers, the Millennials, willingly trade privacy for convenience. They trade information revealing their mobile location for discounts on meals, deals on products, or the lowest prices for gasoline within five miles. They post their visits to restaurants and bars willingly on Facebook and post a host of personal photos and comments on social media. As marketers use big data for even more accurate predictions about consumer needs and wants, the utility of the predictions may outweigh the perceived loss of privacy.

Not all consumers will opt for convenience over privacy. However, significant market segments will do so

and will remove a barrier to marketers and brand managers in their quest to listen to the voice of the customer - and make a profit.

CONCLUSION

As the traditional “brand manager to consumer” one-way information channel continues to erode in the presence of social computing, particularly the vastly increased reach of online word-of-mouth, leveraging social media to replace both understanding and reach becomes increasingly important. While different forms of analytics (together with platforms capable of processing big data volume) have come online in recent years, enabling analysis of social data that was previously inaccessible, there remains the issue of semantic accuracy holding back their potential. While knowing that your brand or product name has been mentioned in the same sentence or paragraph as words indicating desirability is valuable, there are many more conversations or comments left online that are relevant but not currently tractable. The alternative solution set, those involving capturing semantic meaning, are not yet openly deployed, although approaches like facebook’s opengraph and the semantic web / OWL / RDF may pave the way for open standards adoption. The standards exist, as do some persuasive use cases for applications, but critical mass is still lacking. Much like the history of other IT standards, such as EDI in ecommerce, a dominant “hub” organization may need to push hard for a standard for it to be adopted. Inroads have been made, in the form of google adopting micro-formats for search results (rich snippets) and yahoo’s creation of a semantic search engine (Search Monkey). In the meantime, the highest quality data belongs to the organizations that can augment their own rich internal consumer data both with social analytics (in-house or purchased) and data bought from massive data silos like facebook or google.

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AUTHOR BIOGRAPHIES

Danielle C. Fowler is Associate Professor and Chair of the Department of Information Systems and Decision Science, Merrick School of Business, University of Baltimore. She holds a Ph.D. degree from Swinburne University, Melbourne, Australia. Her teaching and research interests are Systems Development, Electronic Commerce and Web Site Development.

Dennis A. Pitta is currently the J. William Middendorf Distinguished Professor at the University of Baltimore. He earned his Ph.D. from the University of Maryland at College Park in business with a concentration in marketing. His research interests focus on the intersection of marketing and information technology as well as brand management. His research has appeared in the *Journal of Consumer Marketing*, the *Journal of Product and Brand Management*, the *Journal of Marketing Development and Competitiveness*, *Advances in International Marketing*, the *International Journal of Business Innovation and Research*, as well as the *International Journal of Advertising*.