



The Validity of Social Media Data within the Wireless Industry

GINA PINGITORE, SUXI LI, ADRIANA GIGLIOTTI, AND MIRIAM ECKERT

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Introduction

Various social media sites, such as Facebook and Twitter, were initially disparaged as evidence of an apparent decline in conventional modes of human interaction, or dismissed as the new “flavor of the week,” with some even observing that it was an unfortunate trend that would ultimately find its way onto the social junk heap.

In the past 2 years, however, there have been major world events whose particular outcomes signal a potential long-term viability for these and other social media (or SM) sites. Events in Iran, Haiti, Egypt, and, most recently, the GOP primary campaign in the United States, demonstrate that these online communicative tools may have finally found their niche, thereby leading to true social significance. Despite the volume and speed of information available via social networking sites, market researchers are still struggling to determine how to best leverage the vast amount of data generated by consumers.

In fact, recent estimates indicate that on any given day, there are nearly 100 million users on Twitter alone, posting messages that range from the inane to the insightful. For market researchers, this vast amount of conversation offers a treasure trove of data to mine for potential insights into the real-time needs of consumers. However, recent findings suggest that SM data is noisier and less precise than data gathered via traditional market research methods. Previous work (Pingitore, Eckert, & Li, 2011), documented how common low inter-analyst reliability is when extracting SM data and identified best practices that can improve both reliability and precision of resulting data, making possible results that are reproducible and accurate.

In this paper, we expanded on these prior findings by examining the validity of SM data. We focused on the wireless communication industry, and will show the relationship between various SM outcomes of volume and sentiment with a number of standard survey measures, including overall experience ratings, advocacy, and switching rates.

Review of Prior Findings

The relationship between various SM metrics and outcomes such as weekend box-office receipts, consumer confidence, presidential approval, and U.S. polling results, has been recently documented. For example, researchers from HP Labs demonstrate that the rate at which tweets are created about particular topics can outperform other market-based predictors in predicting the opening box office receipts of US movies (Huberman & Bernardo, 2010) and cite that their model predicts receipts with 97% accuracy, a higher percentage than a prediction market offers.

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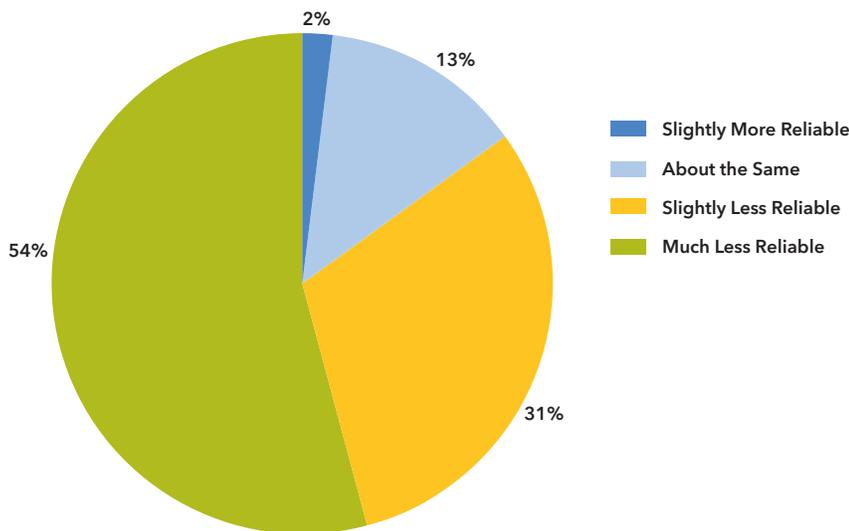
In a study of consumer confidence, Brendan O'Connor, et al (O'Connor, Balasubramanian, Routledge, & Smith, 2010) found a strong correlation ($r=.73$) between the sentiment of tweets about "jobs" and the Gallup daily measurement of consumer confidence. This study also reported about the same magnitude of correlation between sentiment in tweets about President Obama and presidential job approval polls. Similarly, two websites, the Daily Beast and WiseWindow, built a social media model that claimed to predict 97% of US Senate races and 87% of the House of Representative races that it tracked.

Given these findings, it is not unexpected that a recent study conducted by Cision and Don Bates of The George Washington University's Master's Degree Program in Strategic Public Relations (Cision & Bates, 2009) found that reporters depend on SM sources when researching their stories, with 55% of journalists surveyed indicating that SM was "important" or "somewhat important" for reporting and producing stories.

Somewhat unexpected, however, is the perception by these same journalists that SM is not necessarily the most accurate source for facts. According to the study, 85% of journalists indicated that SM information was much less or slightly less reliable than traditional media due in part to the lack of fact-checking, verification, and other reporting standards.

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Reliability of Social Media News



Source: J.D. Power and Associates

Figure 1

Although these findings suggest that SM provides a meaningful relationship to some real-life outcomes, questions arise about the validity of data derived from SM, particularly in relation to market research insights.

Purpose and Methodology

The purpose of this research was to examine the relationship between traditional survey outcomes, as such, satisfaction, loyalty, and advocacy, and SM volume and sentiment.

The survey data used for these comparisons is taken from the *J.D. Power and Associates 2011 US Wireless Total Ownership Study*,SM which included responses from more than 37,000 US wireless customers of the four leading US carriers. This study surveys customers' experience with their wireless carrier, including aspects such as account management, service cost, offerings and promotions, network quality, purchase experience, customer service, and experience with the handset. The primary study outcomes used for our analyses included various voice-of-customer (VOC) ratings, overall experience ratings, stated advocacy, and switching intention. Because this study also provided highly detailed ratings of specific elements of customers' experience with their carrier, we were also able to create new metrics that summarize the ratings across different aspects of the customer experience into another group of categories: people, process, product, price, and presentation (referred to as the 5 Ps).

To obtain SM data, we used NetBase's Theme Manager¹ to extract posts for four North American wireless carriers—AT&T, Verizon, Sprint, and T-Mobile—corresponding to the same fielding time frame as the *2011 US Wireless Total Ownership Study* (i.e., January 2011 to December 2011). The primary outcomes included volume and % positive, % negative, and % unknown/mixed sentiment both overall and for each of the 5 P categories.

Results

Our first assessment was to examine the relationship between overall volume of SM posts and carrier market share as defined by number of subscribers. We started with this simple comparison as a "face validity" assessment to determine whether our SM query extracted a reasonable number of customer posts. We postulated that carriers with higher market share (i.e., more customers) should have more consumers available to make posts across the various social networking sites.

In our initial query extraction, we obtained 5,834,618 total posts across all carriers. Following our annotation best practices reported in Pingitore, Eckert, & Li, 2011, we observed that of the overall volume extracted (Total Generated Media), on average

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¹ NetBase's Theme Manager (<http://www.netbase.com/technology/>) allows users to extract consumer perceptions in the form of sound bites from a large social media data base consisting of blog, message board, Facebook, and Twitter posts. The term *sound bite* is defined by NetBase as "a phrase taken from a longer passage of text that represents the authority or voice of an average person. Sound bites contain one or more insights that may reveal qualitative information about the speaker or topic, such as opinions or emotions."

only about 35% of sound bites were consumer-generated media (CGM). As seen in the table 1, across all carriers the greatest volume of posts were brand marketing and news reports, which, although of potential importance to some outcomes, might blur the relationships with consumers survey responses. Therefore, we refined our query development to specifically elicit CGM posts.

Table 1: Market Share, Number of Subscribers and Social Media Volume

	Market share*	# of subscribers	Annual Total Generated Media (TGM)	Annual Consumer Generated Media (CGM)	% Consumer-Generated Media
AT&T	29.07%	100,738	1,578,073	514,996	33%
Sprint Nextel	11.61%	53,109	1,120,105	435,233	39%
T-Mobile	11.54%	33,711	876,014	320,098	37%
Verizon Wireless	31.16%	107,695	2,260,426	691,907	31%

* Based on the "Wireless Total Ownership Study"

We then correlated both the Annual Total Generated Media (TGM) and the Annual CGM volume to number of subscribers, shown in Table 2 below. Not unexpectedly, the relationship between both the TGM volume and the CGM volume with that to the number of subscribers was essentially the same, suggesting our queries provided a reasonable volume of posts to evaluate.

Table 2: Correlation between Number of Subscribers and Social Media Volume

	# of Subscribers with Total Generated Media	# of Subscribers with CGM only
Correlations	0.92	0.91

Our next assessment was to examine which VOC construct SM metrics most correlated with. We examined the relationship between the scores obtained from the *Wireless Total Ownership Study* and the percentage of positive and negative posts in the SM data. That is, we compared multiple traits (various experience scores and loyalty outcomes from study data) with corresponding SM sentiment results. We expected some convergence among similar measures across SM and the *Wireless Total Ownership Study*, as well as some divergence in others. For example, the percentage of positive SM sentiment for each of the four wireless carriers should be positively correlated with the ownership scores, but negatively correlated with avoidance to recommend the carriers in the study.

To best estimate SM sentiment, we used only ‘high precision’ sound bites from derived from NetBase’s algorithm for ‘richness’². Although this resulted in using only about 10% of the total posts, we did this because these sound bites yielded cleaner and more accurate assessment of affective words (e.g., *like, enjoy, sucks, awesome, etc.*) corresponding to the brand/product of interest. As such, the resulting estimates of positive, negative, and neutral sentiment are more reliable and accurate, better enabling us to find relationships to survey outcomes. However, it is important to note that resulting total volume of posts excluded a vast majority of total sound bites. While the selection of sound bites was applied consistently across brands, further evaluations are needed to determine how the volume of high precision posts varies by brand.

We also examined the correlations for both high precision and overall SM data and various survey outcomes to validate the importance of using only high precision posts. As might be expected, the high precision data yields higher correlations with various VOC measures than the overall data (see Table 3).

Table 3: Comparison of Average Corrected Correlation between High Precision SM Data and Overall SM data

	Overall ownership experience	Advocacy	# Positive recommendations	# Negative recommendations	Switching intention
High precision SM data	0.78	0.90	0.50	0.86	0.67
Overall SM data	0.53	0.71	0.23	0.78	0.33

Brand-Level Sentiment and Survey Results

Brand-level sentiment was obtained from the high precision results from CGM posts only. It was calculated both as a straight percentage of negative and positive related to all posts, as well as a percentage of each with unknowns excluded from the total. Additionally, although all net scores are notoriously less reliable than the straight metrics, we also calculated net sentiment (% positive-negative), as some companies prefer these metrics. This resulted in a total of six versions of sentiment.

² In this article, we use “high precision” to mean “top 10% richest” and therefore deviate from NetBase’s definition. High precision sound bites are defined by NetBase as having the brand name (e.g., AT&T), the insight in the correct form (e.g., *like* as a verb, not a preposition), and the insight referring to the brand (e.g., the brand is the object of like: *I like AT&T*).

We then correlated these sentiment scores with brand-level overall experience scores, recommendation rates, and switching intentions (see Table 4).

Table 4: Correlation Scores for Social Media and Syndicated Data

SM sentiment measure	Overall ownership experience	Advocacy	# Positive recommendations	# Negative recommendations
Negative/total	-0.90	-0.84	-0.78	0.68
Negative/(total-unknown)	-0.77	-0.94	-0.44	0.88
Net Pos	0.85	0.97	0.55	-0.92
Net Pos (ex unknown)	0.85	0.97	0.55	-0.91
Positive/total	0.41	0.71	0.00	-0.82
Positive/(total-unknown)	0.91	0.99	0.65	-0.92
Average corrected correlation	0.78	0.90	0.50	0.86

The data shows that there is a higher correlation between SM data and stated advocacy rate ($r = 0.9$) than there is to the overall wireless ownership experience ($r = 0.78$).

To determine whether stronger relationships could be found between SM sentiment and specific aspects of the customer experience, we created detailed queries to extract sentiment corresponding to key aspects of the wireless ownership experience, including scores related to people (e.g., staff, call center representatives, etc.); product (e.g., network quality); price (fees, costs); processes (e.g., account set up, automated phone system menu, etc.); and presentation (e.g., layout and design of retail stores, website, etc). We then correlated these extracted sub themes to the corresponding experience ratings from our syndicated studies.

Table 5: Correlation between the 5P Categories Analyzed across Methods

SM sentiment measure	People	Presentation	Price	Process	Product
Negative/total	-0.19	-0.82	-0.90	-0.91	-0.97
Negative/(total-unknown)	-0.33	-0.77	-0.57	-0.10	-0.95
Net Pos	0.29	0.46	0.35	-0.44	0.99
Net Pos (ex unknown)	0.28	0.79	0.61	0.24	0.96
Positive/total	0.21	-0.33	-0.34	-0.82	0.93
Positive/(total-unknown)	0.25	0.79	0.65	0.58	0.96
Average corrected correlation	0.26	0.55	0.46	0.09	0.96

Table 5 displays these correlations and shows that, with the exception of the product category and some measures with price, the correlation scores at the sub theme level are fairly low. These findings suggest that either further query refinement could be carried out to increase these correlations, or that the sentiment expressed in SM is more related to the advocacy intention than to specific ratings of the experience.

Conclusions and Next Steps

These initial findings within the wireless industry suggest that SM volumes can correlate with both market share (subscriber volume) and—although based on a small number of brands— that the total volume of posts is a reasonable proxy for a brand’s subscriptions base. These correlations encouraged us to examine further the relationship between study data and SM, as we felt that our SM coverage was in a similar proportion as that of carrier market share.

Previous work (Pingitore, Eckert, & Li, 2011) has shown the importance of creating carefully crafted queries in the SM tool (NetBase’s Theme Manager) and that lack of attention to detail may result in unreliable and inaccurate data. The search queries created for these analyses were the result of collaboration of an expert query writer, statisticians and experts in the telecom industry. In addition, well defined SM QA steps helped to ensure the accuracy and precision of the SM data, and were a necessary precursor to using SM data for any analyses.

Our findings also suggest that SM metrics may correlate with some traditional survey outcomes. Results from the wireless industry analysis suggest that SM data correlates slightly more with advocacy measures than with experience ratings. A possible explanation for this is that SM sources such as Facebook or Twitter are a preferred venue for consumers to make recommendations to others. However, further assessments are needed to replicate these relationships across other industries with a greater number of brands, as well as to expand our findings in the wireless industry.

Finally, although we attempted to determine whether SM could be a leading indicator for various business outcomes such as, the number of subscribers or revenue (e.g., service or equipment), our data was insufficient for this purpose, due primarily to our inability to obtain SM data pre-2011. This effort, however, is a critical next step which we will continue to purpose and encourage others to do the same.

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Appendix

Table 1: Social Media Sentiment Measures

Sentiment	Brand	People	Present	Price	Process	Product	Overall
Negative/total	AT&T PN rev	21%	14%	20%	16%	45%	25%
Negative/total	Sprint PN rev	14%	10%	14%	11%	42%	20%
Negative/total	T-Mobile PN rev	19%	12%	13%	11%	47%	23%
Negative/total	Verizon PN rev	16%	12%	16%	11%	38%	19%
Negative/(total-unknown)	AT&T PN rev	53%	28%	40%	30%	73%	47%
Negative/(total-unknown)	Sprint PN rev	45%	23%	32%	30%	74%	45%
Negative/(total-unknown)	T-Mobile PN rev	46%	25%	31%	22%	75%	46%
Negative/(total-unknown)	Verizon PN rev	44%	27%	30%	28%	59%	39%
net pos	AT&T PN rev	-5%	18%	4%	18%	-35%	-2%
net pos	Sprint PN rev	2%	20%	11%	13%	-31%	1%
net pos	T-Mobile PN rev	2%	21%	11%	23%	-36%	1%
net pos	Verizon PN rev	3%	18%	15%	16%	-18%	7%
net pos (ex unknown)	AT&T PN rev	-12%	36%	8%	34%	-57%	-4%
net pos (ex unknown)	Sprint PN rev	6%	48%	26%	36%	-55%	3%
net pos (ex unknown)	T-Mobile PN rev	4%	43%	27%	45%	-58%	1%
net pos (ex unknown)	Verizon PN rev	7%	38%	28%	39%	-28%	13%
Positive/total	AT&T PN rev	16%	32%	24%	34%	10%	22%
Positive/total	Sprint PN rev	16%	30%	26%	25%	10%	21%
Positive/total	T-Mobile PN rev	20%	34%	24%	34%	11%	24%
Positive/total	Verizon PN rev	18%	30%	31%	27%	20%	26%
Positive/(total-unknown)	AT&T PN rev	41%	64%	47%	64%	16%	43%
Positive/(total-unknown)	Sprint PN rev	52%	70%	58%	65%	18%	48%
Positive/(total-unknown)	T-Mobile PN rev	50%	69%	58%	67%	18%	47%
Positive/(total-unknown)	Verizon PN rev	52%	65%	59%	67%	31%	53%

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