

- What are the discordant conversations about a company, theme, or issue?
- Can we track the emergence of new conversations, their convergence with other conversations, and their proliferation and decline?
- How do conversations influence customers, employees, and suppliers?
- What is the meaning that actors and communities cocreate for a brand?

Second, moving beyond value in exchange to value as cocreated and contextualized, firms can develop metrics such as the following:

- When actors use an organization's product(s), what other resources are integrated with it? How can we model this resource network?
- When actors use an organization's product(s), what goals are they trying to reach?
- What is the level of value cocreation that occurs outside of markets (as in home production or social exchange)?
- What are the cocreation benefits to the firm? What resources or expertise does the firm need to engage in successful cocreation activities with customers, suppliers, employees, and other stakeholders?

Third, moving beyond organizations, the three emerging platforms will require intelligence on the following topics to successfully operate:

- experiences (positive and negative) that people have in interfacing with an organization's engagement platform;
- innovation capital created by open innovation platforms; and
- financial and nonfinancial metrics of the success of exchange platforms.

Market and business intelligence will be gathered on a real-time, on-demand basis. Furthermore, as intelligence providers better learn the needs of the service beneficiary, they will not just sense and respond to needs, they will also anticipate potential needs. A key benefit of the World Wide Web is that it is instantly global and local; business intelligence must be defined around this reality. Consequently, intelligence services should be provided on a macro basis for entire organizations or divisions, but also down to the most micro level to let all individuals better serve others.

**W**ithout an understanding of how markets and organizations developed during the Industrial Revolution, it is difficult to understand the phase transition that markets and organizations are undergoing. Organizations are quickly becoming relatively flat and continuously learning to cocreate value with customers, suppliers, and stakeholders using service engagement, innovation, and exchange platforms. Markets themselves are increasingly coordinated by conversation, interpretation, and meaning-making. We are on the verge of great value being created through collaboration among ecosystem participants. Enterprises that become more entrepreneurial, and recognize that products will increasingly emerge outside the organizations that make product components, will have an advantage in creating wealth.

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**Robert F. Lusch** is the James and Pamela Muzzy Chair in Entrepreneurship and Executive Director of the McGuire Center for Entrepreneurship in the Eller College of Management at the University of Arizona. Contact him at [rlusch@eller.arizona.edu](mailto:rlusch@eller.arizona.edu).

**Yong Liu** is an assistant professor of marketing in the Eller College of Management at the University of Arizona. Contact him at [yoliu@eller.arizona.edu](mailto:yoliu@eller.arizona.edu).

**Yubo Chen** is an assistant professor of marketing in the Eller College of Management at the University of Arizona. Contact him at [yubochoen@eller.arizona.edu](mailto:yubochoen@eller.arizona.edu).

## User-Generated Content on Social Media: Predicting Market Success with Online Word-of-Mouth

Yong Liu, Yubo Chen, Robert F. Lusch, Hsinchun Chen, David Zimbra, and Shuo Zeng, *University of Arizona*

Enabled by Web 2.0 technologies, online social media in the forms of discussion forums, message boards, and blogs has become a prevalent channel

of communication for consumers and businesses. Online social media allows consumers to share their product opinions and experience at an unprecedented pace and scale. This user-generated content, or online *word of mouth* (WOM), has the potential to influence product sales and firm strategy.<sup>1,2</sup> Consequently, as Web-mining and opinion-mining tools and technology continue to proliferate, it is critical to examine how WOM information can be measured and used to improve managerial decisions.

In this article, we explore the predictive validity of various text and sentiment measures of online WOM for the market success of new products. From the firms' perspective, it is important to effectively predict the sales of new products in the product development process. The earlier such a forecast can be made, the more useful it will be, since marketing strategies can then be adjusted accordingly. We thus examine online WOM that appears at different stages of the new-product lifecycle, such as before production, before introduction, and after introduction. New-product development is a highly risky process, and it is useful to examine different aspects of its success. In addition to examining product sales directly, we also study product evaluation by third-party professionals and how the product would receive marketing support from the firm, both of which could influence sales.<sup>3</sup>

The context of our study is the Hollywood movie industry. The forecast of movie sales is highly challenging and has started to incorporate online WOM.<sup>2</sup> We collected online WOM information from the message board of Yahoo Movies for a total of 257 movies released from 2005 to 2006. We used SentiWordNet and OpinionFinder, two lexical packages of computational linguistics, to construct the sentiment measures for

the WOM data.<sup>4,5</sup> We will first examine the evolution patterns of online WOM over time, followed by a correlation analysis of how various sentiment measures relate to the metrics of new product success.

### **New Product Lifecycle and Metrics for Success**

Consistent with the development-introduction-sales process of many new products, the new-product lifecycle for movies can be broadly divided into the following periods:

1. preproduction,
2. from production to movie release,
3. from release to the first week of sales,
4. from the first to the fourth week of sales, and
5. the sales period after the fourth week.

Among these distinctive periods, the first week after release is critical for movies because it captures a large share of the total box office sales and also influences the distributional support in subsequent weeks. We also use the fourth week after release as a critical time, because movie exhibition contracts usually require a minimum number of weeks; four is a common minimum. We collected and measured online WOM for each of these periods: in different periods of the product lifecycle, the product information available to consumers varies, and thus online WOM can carry different informational value and predictive power.

We examined five different metrics of new product success for the movie sample: two final sales measures (opening-week box office and total box office sales), and three intermediate measures that can affect sales (professional evaluation, distribution intensity, and distribution longevity).

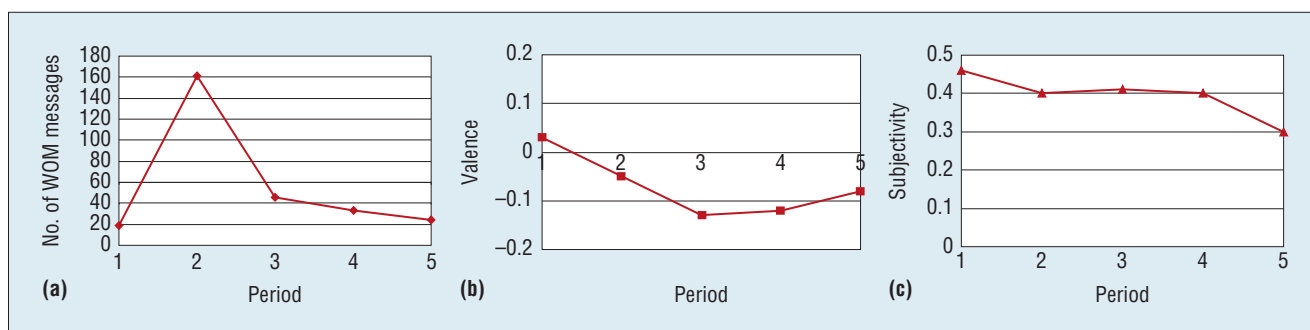
In many markets, third-party professionals provide valuable and credible information about new-product quality.<sup>1,3</sup> Their reviews and evaluations can influence consumer opinions and thus influence product sales. For the movie sample, we collected third-party professional evaluations (that is, critical reviews) of each movie from Metacritic.com, which assigns a numerical score between 0 and 100 for each review.

Firm marketing strategies can also significantly influence final product sales. We studied two important movie marketing strategies—the distribution intensity of a movie in the opening week (opening strength), and the total number of weeks that a movie is shown in theaters (longevity).

### **Text and Sentiment Measures of Online WOM**

Other studies of online WOM, and research on traditional WOM, have identified volume (the amount of communication, usually measured by the number of messages) and valence (WOM being positive or negative) as two important measures of WOM activity. Recent development in opinion mining and computational linguistics has made it possible to employ training and identification techniques to construct more fine-tuned measures. Two important contributions to sentiment analysis are the development of OpinionFinder and SentiWordNet, which assign scores such as positivity, negativity, and objectivity to the texts.<sup>4,5</sup>

We examined five text and sentiment measures of online WOM: number of messages, valence, subjectivity, number of sentences, and number of valence words. Valence is the degree of positivity and negativity, with a score of zero indicating neutrality, more positive values indicating more positive opinions, and more negative values indicating more negative opinions. Subjectivity is the degree to



**Figure 4. Evolution of online word of mouth (WOM) over product lifecycle: (a) number of WOM messages; (b) valence, the positivity or negativity of the WOM; and (c) subjectivity of the WOM. Period 1: preproduction; Period 2: from production to movie release; Period 3: from release to the first week of sales; Period 4: from the first to the fourth week of sales; Period 5: sales period after the fourth week.**

which a message is subjective or objective, with a lower bound of 0 indicating highly objective opinions and a higher bound of 1 indicating highly subjective opinions.

### Evolution of Online WOM Communications over Product Lifecycle

Figure 4 illustrates the evolution of three WOM measures (number of messages, valence, and subjectivity) across the five time periods of movie lifecycle. The patterns show that WOM communication starts early in the preproduction period, becomes highly active before movie release, and gradually diminishes as the movie is shown for more weeks in theaters. Valence has a clear decreasing trend over time, especially from the pre-release period to the opening week, indicating that WOM becomes more negative after movies are released. The subjectivity measure, as well as the number of sentences and the number of valence words per WOM message (not shown due to space limitations), remain fairly stable over time.

How do the measures of WOM correlate with each other in each time period and over time? First, there is a negative correlation between valence and subjectivity, especially for the time periods after movie release ( $p < 0.05$ ). This suggests that more negative WOM tends to be conveyed in more subjective statements. Second,

messages that have a greater number of sentences tend to be more subjective ( $p < 0.01$ ). Third, there is a negative correlation between valence and the number of valence words used ( $p < 0.01$ ), indicating that consumers tend to use more evaluative expressions to express negative opinions.

Across different time periods, the numbers of messages during preproduction, from production to release, and in the opening week are significantly correlated with each other ( $p < 0.01$ ). If the number of messages is a useful indicator of future product sales, this pattern suggests that sales forecast can be made as early as the preproduction period. Valence during preproduction is positively correlated with that prior to release. However, valence during preproduction does not correlate with the valence during the opening week and those in later periods. The degrees of subjectivity have patterns over time similar to those for valence.

### Correlation between WOM and New-Product Performance Metrics

Table 4 presents the correlation between the WOM measures and the five new-product metrics. In terms of professional evaluations, the number of messages and the number of sentences per message are consistently the most useful predictors, starting with Period 2 (from production to release). A movie that receives more

active WOM communication tends to receive higher evaluations from movie critics, suggesting the number of messages could work as a signal for product quality. Interestingly, if a movie attracts more detailed WOM messages (a larger number of sentences on average per message), it also tends to gain higher evaluation from professional critics. One explanation is that such movies might have more sophisticated story line and higher artistic value, two key attributes of product quality that professional critics pay attention to.

The number of WOM messages prior to movie release, but not the number of WOM messages before movie production, is a useful predictor of the movie's opening strength. The movie's longevity is significantly correlated with the number of WOM messages prior to movie release and before movie production.

To predict movie box office sales, both for the opening week and the US gross, the number of WOM messages is consistently the most significant variable. The number of WOM messages during the preproduction period is highly correlated with both box office measures ( $p < 0.01$ ).

The valence of WOM appears not to be correlated with any new-product performance metrics. This is somewhat surprising and indicates that the degree of public attention as captured by the number of WOM

**Table 4. Correlations between measures of online word of mouth and new-product success metrics.**

Period	Sentiment measures	New Product Success Metrics				
		Professional evaluation	Opening strength	Longevity	Opening week sales	Total sales
1. Preproduction	Number of messages	0.199	0.112	0.373**	0.530***	0.499***
	Valence	0.139	-0.279*	-0.173	-0.090	-0.085
	Subjectivity	0.378**	0.030	0.171	0.164	0.195
	Number of sentences	0.106	0.029	0.293*	0.027	0.127
	Number of valence words	0.274	0.064	0.262	0.071	0.166
2. Production to release	Number of messages	0.249***	0.231***	0.200**	0.676***	0.562***
	Valence	0.024	-0.047	0.054	-0.046	-0.031
	Subjectivity	0.004	-0.080	-0.042	-0.001	-0.008
	Number of sentences	0.225***	-0.170**	0.049	0.005	0.049
	Number of valence words	0.121	-0.131	0.021	-0.028	0.011
3. Release to first week of release	Number of messages	0.184**	-	0.147*	0.450***	0.391***
	Valence	0.055	-	0.123	0.079	0.065
	Subjectivity	-0.012	-	-0.146*	-0.134*	-0.107
	Number of sentences	0.138*	-	0.012	-0.008	-0.003
	Number of valence words	0.047	-	-0.045	-0.051	-0.040
4. First week to fourth week of release	Number of messages	0.191**	-	0.119	-	0.224***
	Valence	-0.100	-	0.053	-	-0.018
	Subjectivity	0.126	-	0.001	-	0.109
	Number of sentences	0.223***	-	-0.037	-	0.038
	Number of valence words	0.248***	-	-0.062	-	0.024
5. Fourth week and later	Number of messages	0.146**	-	0.131**	-	0.477***
	Valence	-0.039	-	0.091	-	-0.079
	Subjectivity	0.094	-	0.152**	-	0.225
	Number of sentences	0.228***	-	0.081	-	0.098
	Number of valence words	0.163***	-	0.112	-	0.112

\*  $p < 0.10$   
 \*\*  $p < 0.05$   
 \*\*\*  $p < 0.01$

messages is a more useful predictor for new product performances than the aggregated valence measure. This finding was also consistent with an earlier study on the impact of WOM on movie sales, which provides behavioral rationales for it.<sup>2</sup>

Overall, the number of WOM messages is the most useful predictor of the five new-product metrics. For the purpose of predicting box office sales, the number of WOM messages as early as prior to movie production

can be used. In addition, to predict how the movies will be received by professional critics, the average number of sentences in WOM messages is another good signal besides the number of WOM messages.

**A**dvances in Web 2.0 technologies make it possible to harness business intelligence from various online social media. A recent trend in both academic research and business

practice has been to employ user-generated and online WOM data for descriptive and normative purposes. For instance, retail recommender systems have started to incorporate consumer reviews and product ratings to improve recommendation effectiveness. At a more general level, these data are useful complements to the traditional sales and shipment data that have been employed to understand consumers and markets. With the development of more and better

Web-mining and opinion-mining tools, there will be great opportunities for researchers and managers to derive valuable managerial implications embedded in social media.

In this article we demonstrated the evolution patterns of five text and sentiment WOM measures and how they correlate with several key new-product metrics. Future research should examine the properties of additional text and sentiment measures and explore their value for business applications. Information in different data formats, such as user reviews versus numerical ratings, could have distinctive implications for consumer preference and firm strategies. Similarly, systematic differences might exist among business intelligence gathered from different sources, such as firm-sponsored forums and forums operated by independent organizations.

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See the preceding essay for contact information for Yong Liu, Yubo Chen, and Robert F. Lusch. See the introductory essay for contact information for Hsinchun Chen.

**David Zimbra** is a doctoral student and research assistant in the Department of Management Information Systems and the Artificial Intelligence Lab at the University of Arizona. Contact him at zimbra@email.arizona.edu.

**Shuo Zeng** is a doctoral student and research assistant in the Department of Management Information Systems and the Artificial Intelligence Lab at the University of Arizona. Contact him at shuozeng@email.arizona.edu.

## On Data-Driven Analysis of User-Generated Content

**Claudia Perlich**, *IBM Research*  
**Maytal Saar-Tsechansky**, *University of Texas at Austin*  
**Wojciech Gryc**, *Cambridge University*  
**Mary Helander**, **Rick Lawrence**, and  
**Yan Liu**, *IBM Research*  
**Chandan Reddy**, *Wayne State University*  
**Saharon Rosset**, *Tel Aviv University*

The prevalence of interactive Web sites such as Facebook, Flickr, MySpace, LinkedIn, and YouTube has drawn millions of users to share their personal views and to converse publicly with other Internet users. Online retailers employ user-generated content to provide product recommendations and product reviews that help facilitate potential consumers' decisions. Our interest is to understanding how data-driven methods can be applied to derive value and insights from other types of user-generated content. Important objectives include

- improving the understanding of user behavior,

- deriving insight from content about topics of interest, and
- improving the usability and economic viability of user-generated platforms and communities.

Increasingly, firms have become interested in better understanding how to make effective use of content from forums and how to capitalize on the joint wisdom of employees. One early effort was IBM's World Jam in 2001, an enterprise-wide brainstorming effort that was followed by similar discussion forums. In this article, we discuss data-driven approaches used to derive insights and to characterize user-generated content from IBM's Jams.

## IBM's Jam

The Jam refers to a social-computing exercise with the object of engaging IBM's global workforce in Web-based, moderated brainstorming.<sup>1</sup> Here we discuss methods for and insights from our analysis of the 2007 Innovation Jam. This Jam proceeded in two phases: The first focused on idea creation, and discussions were seeded with four topics of interest to IBM. Following phase 1, a team of experts evaluated the postings to identify promising ideas, yielding 31 "big ideas." The discussions in phase 2 aimed to transform the big ideas into actual products, solutions, and partnerships that would benefit business or society. Finally, a team of strategists identified 10 finalist ideas to receive funding.

A key corporate objective in running a Jam was to provide an environment that facilitated the generation of creative ideas for IBM to pursue. We discuss data-driven methods that facilitate this objective by characterizing the patterns of interactions as well as the content of Jam contributions. We initially explore the extent to which the Jam environment was