

INFORMATION PROPAGATION ON THE WEB 2.0

Mark Elsner

MARKETING IM GLOBALEN WETTBEWERB
MARKETING & GLOBAL COMPETITION

PETER LANG
Internationaler Verlag der Wissenschaften

MARKETING IM GLOBALEN WETTBEWERB
MARKETING & GLOBAL COMPETITION

Herausgegeben von Oliver P. Heil

Vol. 2



PETER LANG

Frankfurt am Main · Berlin · Bern · Bruxelles · New York · Oxford · Wien

Mark Elsner

INFORMATION PROPAGATION

ON THE WEB 2.0

Two Essays on the Propagation
of User-Generated Content and How
It Is Affected by Social Networks



PETER LANG

Internationaler Verlag der Wissenschaften

Bibliographic Information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the internet at <http://dnb.d-nb.de>.

Zugl.: Mainz, Univ., Diss., 2010

Cover and Photo Design:
© Olaf Gloeckler, Atelier Platen, Friedberg

D 77
ISSN 1867-8424
ISBN 978-3-631-61747-2 (Print)
ISBN 978-3-653-01663-5 (E-Book)
DOI 10.3726/978-3-653-01663-5

© Peter Lang GmbH
Internationaler Verlag der Wissenschaften
Frankfurt am Main 2012
All rights reserved.

All parts of this publication are protected by copyright. Any utilisation outside the strict limits of the copyright law, without the permission of the publisher, is forbidden and liable to prosecution. This applies in particular to reproductions, translations, microfilming, and storage and processing in electronic retrieval systems.

www.peterlang.de

Preface

The diffusion of the Internet has considerably changed the basic principles of information exchange and, with it, the practice of Marketing. This new structure is now enabling user-driven conversations across most markets that were simply not possible in the previous era of unidirectional mass communication. In a matter of only a few years these processes have enabled the phenomenon of User-generated Content to develop into highly influential sources in the formation of public opinion about a wide variety of topics. Nowadays, every third Internet user is considered an active user in terms of writing blogposts or commenting on them, uploading Youtube videos, sharing photos on Flickr, or participating in social communities like Facebook or Xing.

As a matter of course, this implies a gaining importance of Social Media for the Marketing discipline. On the one hand, managers face a rapidly increasing amount of daily-published information targeting their companies and products that may develop to reach a wide audience, for better or worse. On the other hand, these new phenomena offer possibilities to interact with customers or other individuals in entirely new ways.

Various examples show that UGC has the potential to seriously affect firms within a couple of days or in hours, as the bicycle accessory manufacturer Kryptonite experienced. A cyclist figured out how to hack with just a ballpoint pen the \$50 *Evolution U-Lock* that Kryptonite claimed to offer "toughest bicycle protection in moderate to high crime areas." The cyclist posted a video of the hacking trick on BikeForums.net. While the story was spreading fast from one website to another with more than 300,000 people having read just the two most popular posts in a few days (Polgreen 2004), Kryptonite chose to remain silent, in spite of being repeatedly contacted (O'Brien 2004). Finally, after a total of five days since the initial post, the story made the *New York Times* (with the headline "The story that infuriates bicyclists"). It was only then the firm responded with a lock-exchange program. Altogether this incident cost the firm more than \$16 million and a considerable amount in damage to reputation and brand equity (Horowitz 2005).

Although this is a somewhat unusual example, it demonstrates one important marketing aspect of the power of UGC—the high degree of public and consumer scrutiny that can quickly emerge on the Web 2.0. Additionally, it is important to note that the rapidly developing and intense public attention generated on the Internet can significantly increase the newsworthiness of a story to mass media like the *New York Times*. This in turn can aid in further propagation of the in-

formation. Product malfunctions like the one described above often prompt individual consumers to share the information with a personal network of individuals. However, the Internet has completely changed the nature of such networks to one of social networks with far and wide reach by including large numbers of people who do not know each other personally. As a consequence, the scope, scale and speed of spreading the information have taken on an entirely different meaning and dimension on the Internet in general, and on the Web 2.0 in particular. Thus, firms can ill afford to take a wait and see attitude when a story about their product evolves.

The work described in this dissertation was carried out at University of Mainz and University of Colorado between January 2008 and December 2010. I am indebted to several people for the successful completion of this work. I am grateful for the generous support of my doctoral advisor Professor Dr. Oliver P. Heil. He has encouraged my research continuously and in many different ways and offered me opportunities to present my work in front of international audiences, allowing me to get unique and very helpful insights. It was this exposure that led to an invitation by Professor Dipankar Chakravarti to visit Leeds School of Business, University of Colorado at Boulder, where I had the chance to spend eight months as a visiting research scholar. I am very thankful for this unique opportunity and the scholarship that was made possible by Professor Heil.

In my time at CU Boulder I had the chance to closely work with Professor Atanu R. Sinha. All the guidance and support he offered during my time there and afterwards were of greatest help and are truly appreciated. My thanks also go to the Wharton Interactive Media Initiative and Marketing Science Institute for financially supporting my research. Further, I thank my colleagues at Johannes Gutenberg University. In particular, Dorothea Rector and Sergio Moccia helped and supported me in many ways, creating a nice and pleasant working atmosphere.

Further, I owe a lot to my family, in particular my parents and my sister. I am truly grateful for their enduring and wholehearted support. And finally, my greatest thanks go to Katrin. She could not have been more supportive and caring throughout those years.

Mark Elsner

Table of Content

List of Figures	9
List of Tables	11
Essay 1: Spreading the Word	15
1. Introduction	17
2. User-generated Content and the Web 2.0.....	21
2.1 Relevance.....	21
2.2 Definition.....	23
3. Relevant concepts and literature.....	25
3.1 Marketing relevance	25
3.2 Motivation to participate	26
3.3 Opinion Leadership	27
4. Conceptual Framework and Hypotheses.....	29
4.1 Conceptual Framework.....	29
4.2 Hypotheses.....	30
4.2.1 Size of the submitter network.....	30
4.2.2 Structure of submitter networks	32
4.2.3 Cascades	35
5. Source network and data	39
5.1 Source network structure	39
5.2 The data.....	41
6. Findings	43
6.1 Descriptive results	43
6.1.1 Dynamics of overall voting pattern.....	43
6.1.2 Distribution of popular stories.....	46
6.1.3 Categorical analysis.....	47
6.1.4 Network size and structure	48
6.2 Empirical model and results	52
6.2.1 Survival analysis.....	52

6.2.2	Model specifications.....	53
6.2.3	Model results for network size and structure	54
6.2.4	Model results for user activity.....	59
6.2.5	Model results for content analysis.....	66
6.3	Results for global cascades.....	77
6.4	Network analysis	81
7.	Conclusions	85
7.1	Discussion of results	85
7.2	Limitations and future research	86
Essay 2: How Social Networks Develop on the Web 2.0.....		89
1.	Introduction	91
2.	Utility of networks.....	93
3.	Development of egocentric network.....	97
3.1	General network formation.....	97
3.2	Initial stage.....	98
3.3	Tie strength	99
4.	Conclusion.....	101
References		103
Appendices		107
Appendix 1: Data collection and transformation.....		107
Data transformation		112
Appendix 2: Additional figures and tables		113

List of Figures

Figure 1: Timeline of propagation for a randomly chosen set of popular stories (12 days)	44
Figure 2: Timeline of propagation for a randomly chosen set of popular stories (40 hours).....	45
Figure 3: Time till popularity for 846 stories submitted Sept 14–20, 2009.....	46
Figure 4: Number of diggs in the 24h after submission.....	51
Figure 5: Subnetwork A	83
Figure 6: Subnetwork B	84
Figure 7: Number of popular stories per user.	113
Figure 8: Scree plot	125

List of Tables

Table 1: Distribution of users and their submitted front page stories.....	47
Table 2: Category * Status Crosstabulation.....	48
Table 3: Summary statistics for data period Sept 14-20, 2009.....	49
Table 4: Network size and activity.....	50
Table 5: Results for models 1a – 3a.....	55
Table 6: Results for model 1b – 3b.....	56
Table 7: Results for model 4 -6.....	58
Table 8: Results for models 10a - 12a.....	61
Table 9: Results for models 10b – 12b.....	62
Table 10: Results for models 19a – 21a.....	64
Table 11: Results for model 19b – 21b.....	65
Table 12: Results for models 25a – 27a.....	68
Table 13: Results for models 25b – 27b.....	69
Table 14: Results for models 28a – 30a.....	71
Table 15: Results for models 28b – 30b.....	72
Table 16: Descriptive statistics for Constructs 1 - 9.....	74
Table 17: Results for models 31a – 33a.....	75
Table 18: Results for models 31b – 33b.....	76
Table 19: Results of models 34 - 36.....	79
Table 20: Results for models 37 - 39.....	80
Table 21: Network statistics for subnetworks A and B.....	82
Table 22: Game 1.....	94
Table 23: Game 2.....	94
Table 24: Results of models 7a – 9a.....	114
Table 25: Results of models 7b – 9b.....	115
Table 26: Results of models 13a – 15a.....	116
Table 27: Results of models 13b – 15b.....	117
Table 28: Results of models 16a – 18a.....	118
Table 29: Results of models 16b – 18b.....	119
Table 30: LIWC 2007 Categories.....	120
Table 31: Eigenvalues and rotation sums of squared loadings.....	123
Table 32: Factor loadings and Cronbachs Alpha for new constructs.....	126
Table 33: Results of models 40 - 42.....	131

**Essay I: Spreading the Word – Assessing the
Factors that Determine the Popularity of
User-generated Content**

