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Negative WoM and its Transmission on OSN: The Determining Role of the Seeding Population

ABSTRACT

This paper is a contribution to the knowledge of WoM transmission on OSN. We specifically analyze the role of the seeding population diffusion of negative WoM. The method is based on an experiment on the Facebook fan base of an existing company. We manage to control the four elements of a successful WoM communication: the message, the social structure of the network, the characteristics of the individuals in the network, and the seeding population. We develop an original method to dissociate a seeding population from the general population and compare the diffusion of a set of negative messages distributed to both the original population and the artificially targeted subset. Results show the impact of the seeding population's characteristics on the diffusion of consumers' negative messages. We specifically show the impact of the carrier on the virality of the message.

KEY WORDS: viral marketing, Negative Word of Mouth (NWOM), network engineering, Online Social Networks, Initial Seeding Population, Facebook

STRESZCZENIE

Negatywne opinie oraz ich rozprzestrzenianie się w internetowych mediach społecznościowych: rola wyznacznikowa populacji początkowej

Artykuł stanowi wkład w wiedzę dotyczącą transmisji WoM (*Word of Mouth*) w sieciach społecznościowych (OSN). Analizujemy w szczególności rolę rozprzestrzeniania się antyreklamy w populacji użytkowników. Metoda badawcza opiera się na eksperymencie wykonanym na społeczności fanów realnie istniejącej marki na Facebooku. Udało nam się poddać kontroli cztery elementy skutecznej komunikacji WoM: komunikat, strukturę społeczną sieci, charakterystykę jednostek w sieci, populację początkową (*seeding population*). Wypracowaliśmy autorską metodę wyodrębniania takiej populacji z ogółu oraz porównywania rozprzestrzeniania się zestawu negatywnych komunikatów dostarczonych zarówno populacji pierwotnej, jak i sztucznie wyznaczonemu jej podzbiorowi. Wyniki pokazują skutki oddziaływania cech populacji początkowej na wiralne rozprzestrzenianie się negatywnych opinii konsumentów. Ukazujemy w szczególności wpływ nośnika komunikatu na jego wiralność.

SŁOWA KLUCZE: marketing wirusowy, antyreklama (NWOM), zarządzanie siecią, media społecznościowe, Initial Seeding Population, Facebook

Introduction

More and more companies see online social networks (OSN) as a necessary tool and are including these networks in their marketing strategy and management practices.[1] Yet, because they offer untampered communication, OSN can be a double-edged sword. This shift in control from companies and governments to end users of technology or "technology enabled collective action" or "smart mobs" was already announced by Howard Rheingold in 2002.[2] Brands have involuntarily relinquished control to online communities which are now targeting brands instead of

1 N.G. Barnes, A.M. Lescault, S. Wright, *Fortune 500 Are Bullish on Social Media*, University of Massachusetts Dartmouth, http://www.umassd.edu/cmr/socialmediaresearch/2013fortune500, 2013; C. Li, Bernoff J., *Groundswell: Winning in a world transformed by social technologies*, 2011.

2 H. Rheingold, *Smart mobs: The next social revolution*, Social Forces, Basic Books, 2007.

brands targeting them.[3] Pampers, Nestlé and other brands have already paid the heavy price of unsatisfied Facebook communities.[4]

Negative WoM transmitted by dissatisfied consumers has been studied largely in marketing before the development of OSN, mainly relatively to the preoccupation on satisfaction around the 1970s. Lazarsfeld (1955) had identified the role of leaders in disseminating information. Later, Rishing (1983) examined negative WoM of dissatisfied consumers and Singh offered a model based on Hirshman's framework for Exit, Voice and Loyalty (1990). The development of the Internet and then OSN gave another dimension to e-word of mouth with the preoccupation of e-reputation.[5] EWoM can now be considered as a marketing signal which is defined as an activity that provides information regarding unobservable aspects of a product.[6] Reputation of a brand or product is established through these marketing signals[7] that can be used as a strategic influence to convey or attack the reputation of a brand or product.

In this paper, we specifically explore the negative e-reputation WoM on Facebook. We republish negative messages from a brand's Facebook page on the timeline of fake profiles that have befriended engaged fans (likers and commenters) of the brand's page. We analyze the results of the diffusion of messages to this subset of the larger community on Facebook timelines and compare the results with the diffusion of the same messages on the brand's page.

The first part presents a review of literature on WoM and its transmission. We specify some elements on negative WoM. The second part exposes the method. Then we present the result and discuss them before concluding the paper.

Negative WoM and its transmission

Negative WoM is a preoccupation for marketers in charge of the e-reputation. Firms and companies are now training people and using tools to

3 S. Fournier, J. Avery, *The uninvited brand*, "Business Horizons," 2011, 54, pp. 193-207. DOI: 10.1016/j.bushor.2011.01.001.

4 V. Champoux, J. Durgee, L. McGlynn, *Corporate Facebook pages: when "fans" attack*, "Journal of Business Strategy," 2012, 33, pp. 22-30. DOI:10.1108/02756661211206717; P. Gillin, *Attack of the Customers: The Pampers Dry Max Crisis*, 2012, 1-7; E. Steel, *Nestlé takes a beating on social--media sites*, "The Wall Street Journal," 2010.

5 H. Rheingold, *Smart mobs: The next social revolution*, op. cit.

6 P. Herbig, J. Milewicz, *The relationship of reputation and credibility to brand success*, "Journal of Consumer Marketing," 1993, 10, pp. 18-24. DOI: 10.1108/EUM0000000002601.

7 Ibidem.

monitor bad e-reputation messages.[8] Studies show that the organization of negative communication has a direct effect on brand evaluations.[9] On social netwoks, positive WoM occurs more frequently than negative WoM in different proportions depending on business category and market share.[10] East et al. estimate the ratio of positive WoM over negative WoM to be 3:1. However, negative WoM has a stronger influence on customers' brand evaluations than positive WOM Communication[11] due to negative information being considered more indicative of actual performance.[12] Naylor et al.[13] found that customers are more likely to diffuse negative WoM faster than positive WoM even if positive WoM occurs more frequently, showing that negative WoM is diffused more largely. Their findings came to support previous findings of Silverman.[14]

This negative WoM may indicate maneuvers of influence strategies led by competitors with malevolent intentions. In this perspective, the Internet is a "magma of influence" where every social node or organization is trying to influence others.[15] The advantages of online social networks in playing an influential role are numerous: communication speed, shorter social paths, targeted and direct one-to-one communication, etc. For instance, thanks to Facebook, the small-word effect and six degrees of separation dropped from 6 in the USA to 4.7 worldwide, significantly shortening the distance, in term of links between two random persons.[16] People and organizations are taking advantage of this situation, increasing power

8 E. Cuvelier, M. Aufaure, *EVARIST : un outil de monitoring du buzz et de l ' e-reputation sur Twitter 1 Introduction 2 Twitter et Micro-Blogging*, 2011.

9 R.N. Laczniak, T.E. DeCarlo, S.N. Ramaswami, *Consumers' Responses to Negative Word-of--Mouth Communication: An Attribution Theory Perspective*, "Journal of Consumer Psychology," 2001, 11, pp. 57-73. DOI: 10.1207/S15327663JCP1101_5.

10 R. East, K. Hammond, M. Wright, *The relative incidence of positive and negative word of mouth: A multi-category study*, "International Journal of Research in Marketing," 2007, 24, pp. 175-184. DOI: 10.1016/j.ijresmar.2006.12.004.

11 J. Arndt, *Role of product-related conversations in the diffusion of a new product*, "Journal of Marketing Research IV," 1967, pp. 291-295.

12 M. Kamins, V. Folkes, L. Perner, *Consumer responses to rumors: Good news, bad news*, "Journal of Consumer Psychology," 1997, pp. 22-23. DOI: 10.1207/s15327663jcp0602.

13 G. Naylor, S. Kleiser, *Negative versus positive word-of-mouth: An exception to the rule*, "Journal of Consumer Satisfaction," 2000.

14 G. Silverman, *How to harness the awesome power of word of mouth*, "Direct Marketing Review November," 1997, 32-37.

15 D. Heiderich, *Influence sur internet. Observatoire International des Crises*, 2009; E. Vaille E., *La prise en compte du risque d opinion dans les stratégies d influences sur Internet*, 2010.

16 J. Ugander, B. Karrer, L. Backstrom, C. Marlow, *The anatomy of the facebook social graph*, "arXiv," 2011, pp. 1-17.

and control of end users and communities.[17] Unlike traditional marketing, communication can now easily move both ways, top to bottom and bottom to top, and also create lateral channels between customers or groups of customers outside the control of the brand. Customers can reach and attack a company and force it to take action instantly[18] even using false accusations, as most readers, today, do not verify the authenticity of the information provided and often follow their instinct rather than minds.[19] The case of the Pampers attack is a significant example: without any scientific evidence, a group of unhappy customers declared war on Pampers on a Facebook page that quickly reached 11,000 dissatisfied customers. It took P&G more than a year to restore its lost trust. Dunn et al.[20] confirm that consumers are being influenced by WOM more than by any other source of information including peer reports, and that users transmit rumors frantically and cause significant damage to companies, especially when they use computer mediated communication.

It, therefore, becomes essential for marketers and communication strategists to understand the process of WoM diffusion. Hinz et al.[21] have identified four critical success factors behind viral marketing success: the content of a message, the social structure of the network, the behavioral characteristic of the recipients and the seeding strategy. Concerning these four factors, we observe the following elements:

1. The content of the message has been considered as a determining element in the success of its diffusion. Online communities rely massively on it as the main key of their WoM communication strategy.[22] Studies have analyzed the content through two dimensions, its attractiveness level and how memorable it can be.[23] This focus on the content of the message is however criticized by Hinz et al.[24] and

17 S. Fournier, J. Avery, *The uninvited brand*, op. cit.; H. Rheingold, *Smart mobs: The next social revolution*, op. cit.

18 V. Champoux, J. Durgee, L. McGlynn, *Corporate Facebook pages*, op. cit.

19 H. Dunn, C. Allen, *Rumors, urban legends and internet hoaxes*, Proceedings of the Annual Meeting of …, 2005, pp. 85-91.

20 Ibidem.

21 O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing: an empirical comparison*, "Journal of Marketing," 2011, 75, pp. 55-71.

22 J. Berger, K. Milkman, *What makes online content viral? Available at SSRN 1528077 XLIX*, 2009, pp. 192-205; M.J. Valos, D.H.B. Bednall, B. Callaghan, *The impact of Porter's strategy types on the role of market research and customer relationship management*, "Marketing Intelligence & Planning," 2007, 25, pp. 147-156. DOI:10.1108/02634500710737933.

23 J. Berger, K. Milkman, *What makes online content viral*, op. cit.

24 O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.

Valente and Myers[25] who observe that the other elements that drive viral marketing have often been neglected.

2. The structure of the social network is also identified as an important factor in the diffusion of a message. Bampo et al.[26] consider three different network structures, random, small world and scale free. Using simulations, they show that the spreading scheme is different depending on the size and connections of a social network.
3. The behavioral characteristics of the recipients and their incentives for sharing the message play an important part as well in the diffusion of the message:[27] From a social perspective, diffusion is strongly correlated to the behavioral characteristics of the recipients. While some scholars recommend targeting hubs to increase WOM,[28] others recommend focusing on the individual characteristics of each node as an opinion leader[29] or as an easily influenced person.[30] Booth and Matic[31] describe individuals in the network as "somebodies" and "nobodies" finding that it is the influencers who bring change. Watts and Dodds[32] alternatively suggest that it is a critical mass of easily influenced individuals who is the key to the formation of public opinion. Ardnt[33] shows that the WOM pressure affects and is shared differently between high and low-risk perceivers, while Liu-Thompkins[34] finds that people with strong ties to the company are more likely to share WOM. Even if some research results may appear contradictory (should we target influencers, easily influenced people, hubs or strong ties?), it is clear that the behavioral characteristics of the recipients (will they share, comment,

25 T.W. Valente, R. Myers, *The Messenger is the Medium: Communication and Diffusion Principles in the Process of Behavior Change*, "Estudios Sobre las Culturas," 2010, XVI, pp. 249-276.

26 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure of Digital Networks on Viral Marketing Performance*, "Information Systems Research," 2008, 19, pp. 273-290. DOI: 10.1287/isre.1070.0152.

27 M. Kamins, V. Folkes, L. Perner, *Consumer responses to rumors*, op. cit.

28 O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.

29 T.W. Valente, *Network interventions*, "Science" (New York, N.Y.), 2012, 337, pp. 49-53. DOI:10.1126/science.1217330.

30 D. Watts, P. Dodds, *Influentials, networks, and public opinion formation*, "Journal of Consumer Research," 2007, 34, pp. 441-458.

31 N. Booth, J. Matic, *Mapping and leveraging influencers in social media to shape corporate brand perceptions*, "Corporate Communications: An International Journal," 2011.

32 D. Watts, P. Dodds, *Influentials, networks, and public opinion formation*, op. cit.

33 J. Arndt, *Role of product-related conversations*, op. cit.

34 Y. Liu-Thompkins, *Seeding viral content: The Role of Message and Network Factors*, "Journal of Advertising Research," 2012, 52, 465. DOI: 10.2501/JAR-52-4-465-478.

like or avoid interactions), have an important role in the diffusion of WoM.

4. Finally, scholars agree that the initial seeding population is the key to an efficient viral marketing campaign.[35] The seeding strategy determines the initial set of target consumers chosen by the initiator of the campaign.[36] Recent studies suggest that the choice of seeds is more important than the size of the population and that, by targeting the right seeds rather than the whole population, better results are achieved.[37] Watts and Dodds[38] support this finding and state that influence is driven by a small group of easily influenced people and not by influential people. Again, Valente and Myers[39] suggest that influence is more about the messenger than the message itself). All of these studies seem to point to the fact that change is driven by the individuals or the small groups of individuals who carry the message, not by mass distribution of the information. Bampo and al.[40] write that the marketing challenge should be to target enough seeds with a high enough "epidemic threshold" to achieve campaign objectives without the unnecessary expense and possibly negative impact of flooding the target population with mass marketing.

On online social networks, marketers and researcher have no control over all four elements of viral marketing. While the marketer can control the content of his message, he is not in control, nor has the necessary data about the recipients of the message, their characteristics and the structure of the network. For example, on a Facebook page, based on a "secret" algorithm, only an undetermined part of the fans will see the message. Empirical experiments estimate this number to vary between 1% and 33% depending on the number of fans of the page amongst other factors.[41] Those

35 O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.; Y. Liu-Thompkins, *Seeding viral content*, op. cit.

36 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure*, op. cit.; Y. Liu-Thompkins, *Seeding viral content*, op. cit.

37 Y. Liu-Thompkins, *Seeding viral content*, op. cit.; D. Scarpi, *Does size matter? An examination of small and large web-based brand communities*, "Journal of Interactive Marketing," 2010.

38 D. Watts, P. Dodds, *Influentials, networks, and public opinion formation*, op. cit.

39 T.W. Valente, R. Myers, *The Messenger is the Medium*, op. cit.

40 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure*, op. cit.

41 Agorapulse, Facebook Page Barometer, 2015, http://barometer.agorapulse.com/ (access: 05.12.2015); J. Constine, *Why Is Facebook Page Reach Decreasing? More Competition And Limited Attention*, 2014, http://techcrunch.com/2014/04/03/the-filtered-feed-problem; J. Loomer, *No, Facebook Organic Page Reach Is Not Dead*, 2015, http://www.jonloomer.com/2015/02/03/facebook-organic-page-reach-is-not-dead/; S. Miller, *The Bigger the*

targeted fans are not necessarily hubs, influencers, or have any other special position in the network or characteristics as individuals. This is why posting on a Facebook page, even if distribution (post boost) can be fine-tuned to target fans of a specific gender, age group, etc., can be considered a distribution to a relatively random subset of a larger population. Because the marketer has no control over the seeding population, the structure of the network and the behavior characteristics of the recipients, the virality of the message is, to some extents, scientifically unpredictable.

Studies show that engaging in negative WOM is not a function of the amount of WOM activity.[42] In other words, in a defamatory campaign, the number of negative messages, posts or tweets, with analogous content to the same group, should not generate more NWoM. Studies also show that a well-organized negative communication has a direct effect on brand evaluations.[43] This implies that control and tweaking of the elements of viral marketing can increase the amount of negative communication generated through WoM compared to a non-optimized distribution of the same negative messages. Therefore, we decide to use the fans who interact frequently with the posts of the brand's Facebook page as the initial seeding population. We also use Facebook timelines instead of the brand's Facebook page to maximize distribution and control all the elements of viral communication. We re-post the same negative messages that were previously posted by dissatisfied fans on the Facebook brand's page without any modification. Finally, we compare the reach of the set of negative messages originally published on the brand's Facebook page to the reach of the same messages diffused through Facebook personal timelines to a meticulously selected seeding population.

For this experiment, we create and use two fake profiles (control over the messengers). Those fake profiles will befriend people who have co-commented or co-liked negative posts (control over the network structure). Because they have already engaged with negative messages, we presume that they will comment again on these messages if they are posted again (control over behavioral characteristics). After building our new network of engaged fans of the brand around our two fake profiles, we post negative messages to this seeding population (control over the sharing strategy).

In order to achieve this experiment, we contacted a company's manager who agreed, without the knowledge of any other staff member or

Facebook Page, the Harder it is to Reach Fans, 2013, http://blogs.adobe.com/socialpractice/the-bigger-the-facebook-page-the-harder-it-is-to-reach-fans.

42 G. Naylor, S. Kleiser, *Negative versus positive*, op. cit.

43 R.N. Laczniak, T.E. DeCarlo, S.N. Ramaswami, *Consumers' Responses*, op. cit.

consumer, to allow us to reuse the posts of fans on his company's Facebook page in order to test the reactions of his customer service department and social media manager. The use of an existing brand adds realism to the experiment and help us experiment a real-life situation.

Methods

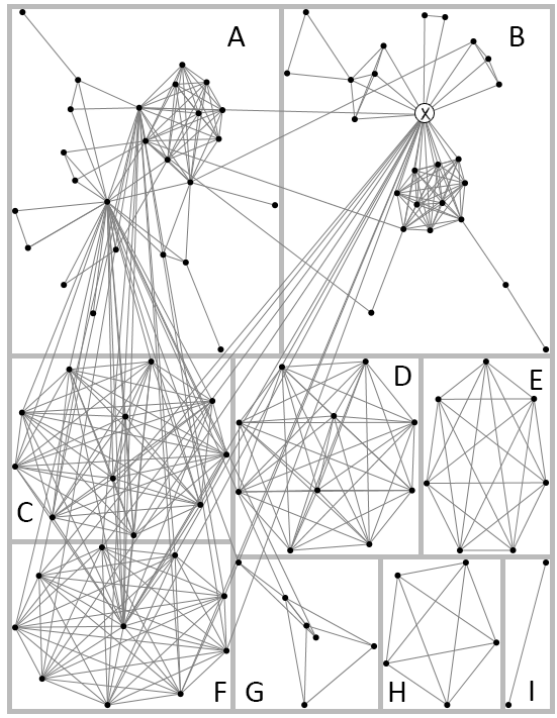
Our experiment uses the Facebook page and posts of a small European company that has around 1,500 fans. An analysis of the data insights provided by Facebook shows that between one and two new posts are published every week with an organic reach varying between 2 and 60% of the total fan population. On average, each post reaches 31% of fans. Facebook's defines engagement as the fact of clicking, liking, sharing or commenting on a Facebook message. Because we do not have access to the names or Facebook IDs of people who click on a message, in this experiment, we consider engagement as the fact of liking, commenting or sharing a message. User engagement by post varies between 0 and 130 fans engaging with likes, comments or shares. An analysis over the past year (2013) shows that thirty fans engage, in average, with each post.

We extract all 500 posts published on the company's page and find that 72 unique fans are engaged in co-comments. This number is equal to 4.8% of the total number of fans (1,500) of the page. 711 unique fans are engaged in co-likes, evidencing that more than 47% of the total fan base interacts with posts on this Facebook page.

The density of the co-commenters graph is equal to 33%. In figure 1, we used NodeXL[44] to draw the social graph of co-commenters and group them by clusters (fans who comment on the same posts). We detect twelve clusters amongst which nine clusters, A, B, C, D, F and G, who are connected by bridges (fans who have joined the conversations of several clusters). For instance, fan "x" at the center of cluster B, has joined the conversations of fans in clusters A, C, F, D and G. We also notice three small completely independent clusters, E, H and I, representing 10.4% of the population, engaged in parallel discussions (could be posts related to specialty products, or discussions that are not of common interest). The density value and the bridges clearly illustrate high interaction between engaged fans.

44 D. Hansen, B. Shneiderman, M. Smith, *Analyzing social media networks with NodeXL: Insights from a connected world*, Proceedings of the …, 2011.

Figure 1



Using the Facebook page of the brand to diffuse positive or negative WoM has four major drawbacks:

1. it makes it impossible to target engaging fans only or a subset of chosen individuals,
2. our posts can be deleted by the page's admins and our "users" banned,
3. our messenger will not be a "friend" or "acquaintance," rather "another consumer," and
4. based on empiric tests, the organic reach (Facebook free distribution of posts) on Facebook personal timelines[45] is much higher than the organic distribution on Facebook pages.[46]

We would like to demonstrate that, by creating a seeding population of engaged fans only and controlling the behavior characteristics of the

45 M. Bernstein, E. Bakshy, M. Burke, B. Karrer, *Quantifying the invisible audience in social networks*, "Proceedings of the SIGCHI," 2013.

46 Agorapulse, Facebook Page Barometer, 2015, op. cit.

members of the network (people who have already engaged in posts for this brand), we could increase the diffusion of NWoM. For this purpose, we create two fake Facebook profiles to infiltrate the network of engaged fans, enticing them to accept friendship. We use two fake profiles, the first one with the characteristics compiled by Barracuda Labs social networking analysis.[47] This research shows that 97% of fake profiles are young women, interested in both sexes, living in big cities, etc. Our first profile follows these "guidelines." The second one has opposite characteristics: mature man in his sixties, married with children, etc. Both profiles have just a couple of photos published on their profile, and no posts or comments that could influence the decision to accept their friends' requests. Their physical appearance and the fake names used may be considered as factors influencing the acceptance of friendship. Yet, our question is not in the reasons why our brand's fans will accept to befriend those profiles but, in their reactions, once their new fake friends will start posting negative messages about the brand.

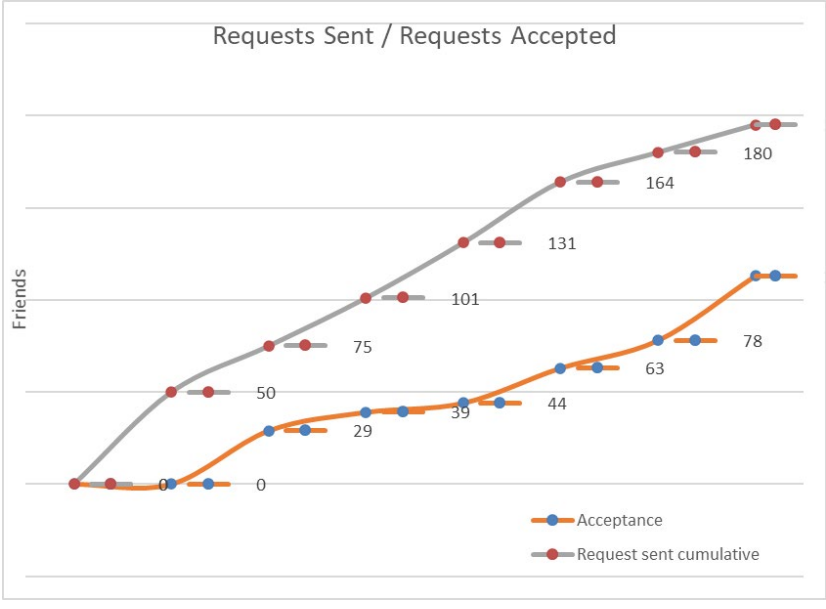
Both profiles were created from scratch without any friend at the beginning. In order not to influence fans in engaging with their comments, our fake profiles have not interacted in any way with the fans of the brand's page throughout the experiment. We decide to send only standard friend request messages (no personal messages even as replies when private messages are sent to the fake profiles). We extract the names of all the fans who have engaged with the brand by commenting, liking or sharing posts on the brand's Facebook page. Those fans are extracted using NodeXL's social network importer.[48] We send friend requests to the 700 engaged fans extracted. To avoid suspicion, we do not send a friend request to the same person from both profiles simultaneously but, rather, do this almost randomly, deciding to send the request from the first or the second fake profile in no particular order and for no particular reason. We manage to befriend 187 engaged fans of the brand on the first profile (young woman) and 113 on the second profile (mature man).

The graph below (figure 2) shows requests sent vs requests accepted on the second profile.

47 K. Krombholz, D. Merkl, E. Weippl, *Fake identities in social media: A case study on the sustainability of the Facebook business model*, "Journal of Service Science Research," 2012, 4, pp. 175-212. DOI: http://dx.doi.org/10.1007/s12927-012-0008-z; F.Y. Rashid, *IT Security & Network Security News: Facebook Scammers Create Fake Profiles to Facebook Scammers Create Fake Profiles to Spam Users*, Click-Jacking ... eweek.com, 2012.

48 Social Media Research Foundation, Social Network Importer for NodeXL, 2015, http://socialnetimporter.codeplex.com.

Figure 2



The resulting global network

Using both profiles, we managed to befriend 300 engaged fans (commenters, likers, sharers) of the brand. The social graph below shows the networks of both profiles combined. Friends of the first profile are colored in dark blue and friends of the second profile in light blue. At the center, 30 dots represent mutual friends of both profiles.

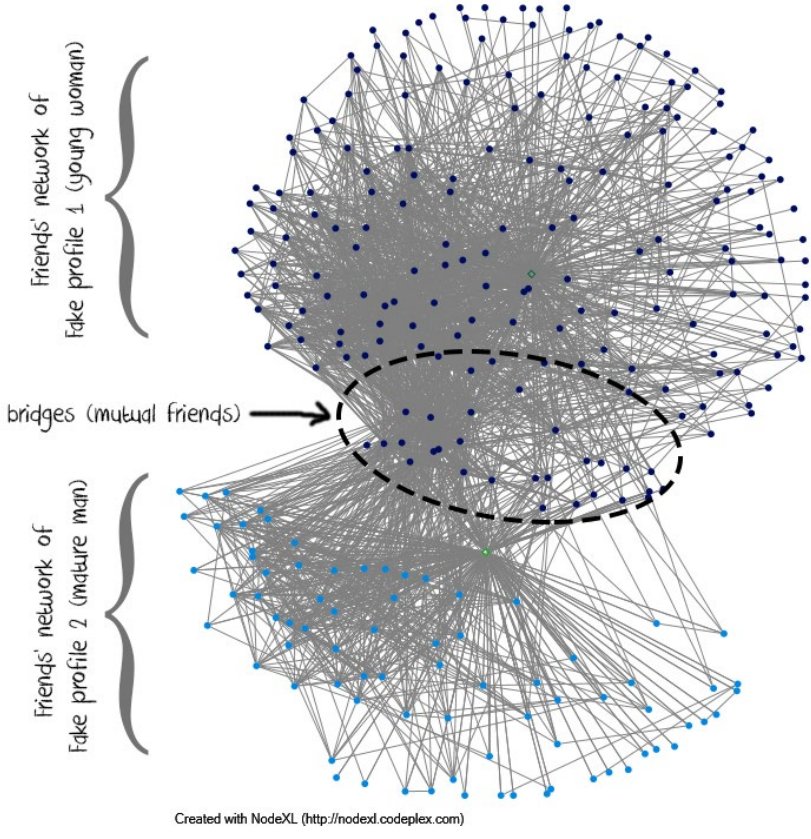
Redistributing the messages to the seeding population

We reuse the last six negative customers' complaints from the brand's page and post them on our fake profile's timelines. We use the last six posts because of their recentness. We choose negative comments because negative WOM communication has a stronger influence on customers' brand evaluations than positive WOM Communication[49] due to negative

49 J. Arndt, *Role of product-related conversations*, op. cit.

information being considered more indicative of actual performance.[50] If this experiment succeeds, the strategy should show a significant increase in NWOM. On the brand's page, these posts never received more than five likes each. We publish each post only once, as research has shown that engagement with negative WOM is not a function of the amount of WOM activity[51] and, just a few posts, published once, should be indicative of the outcomes of the method.

Figure 3



At this point of the experiment, we have control over the four elements essential for viral marketing strategy success:

50 M. Kamins, V. Folkes, L. Perner, *Consumer responses to rumors*, op. cit.

51 G. Naylor, S. Kleiser, *Negative versus positive*, op. cit.

1. The content: The purpose of the experiment is to compare negative WoM diffusion from a Facebook page to a personal timeline within a community of fans. Our intention is not to evaluate the content itself and we are not trying to evaluate the diffusion according to the attractiveness or memorable features of the messages. We rather intend to be close to reality and use existing messages rather than creating new ones. That is why we republish old messages from the Facebook brand's page to the fake profiles' timelines. This should allow us to compare the diffusion of the same messages on the Facebook page with a random population, and on Facebook timelines with an elected set of friends as a seeding population.
2. The social structure of the network: Using Facebook personal timelines (profiles) instead of Facebook pages allow us to determine the edges between the vertices of the network (A is friend with B), something constrained by Facebook when using the data extracted from a Facebook page. Our network has a short geodesic distance and strong ties (16 ties in average). Hinz et al.[52] assume that seeding to well-connected individuals is the most successful approach because these attractive seeding points are more likely to participate in viral marketing campaigns. Getting the brand's fans to become "friends" changes the structure of the network and the nature of the communication from consumer-to-consumer to friend-to-friend. Moving fans to Facebook timelines unlocks access to the social structure of the network.
3. The behavior characteristics of the recipients: We have only selected fans that already interacted with the messages we are resending. Those recipients have all liked or commented on those posts on the brand's page. We expect this group to interact again because pairs of individuals who interacted previously have greater opportunity to influence one another and have more aligned interests, which increases the chances of contagion.[53] Because of earlier interventions amongst its members, this group is a seeding population with an "epidemic threshold."[54]

52 O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.

53 E. Bakshy, I. Rosenn, C. Marlow, L. Adamic, *The role of social networks in information diffusion*, Proceedings of the 21st …, 2012; J. Brown, P. Reingen, *Social ties and word-of-mouth referral behavior*, "Journal of Consumer research," 1987, pp. 350-363; S. Hill, F. Provost, C. Volinsky, *Network-Based Marketing: Identifying Likely Adopters via Consumer Networks*, "Statistical Science," 2006, 21, pp. 256-276. DOI: 10.1214/088342306000000222.

54 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure*, op. cit.; Y. Liu-Thompkins, *Seeding viral content*, op. cit.; D. Scarpi, *Does size matter?*, op. cit.

4. The seeding strategy: based on a study by Bernstein et al.,[55] each published post on a Facebook timeline reaches around 24% of the friends of the profile. We therefore expect our posts to reach 24% of the friend of each of our fake profiles. Moreover, seeding the same messages on a personal profile (a group of friends) rather than the brand's page (a group of consumers of the same product or lovers of the same brand) may be perceived as a "tweak to the environment" which is one of the elements that facilitates change.[56] Indeed, Heath and Heath suggest that by changing the environment to make tasks easier to perform may encourage those who are still hesitant to take action. In our case, by switching from a Facebook page where fans' comments are hard to find and are not displayed directly on their friends' newsfeed, to Facebook timelines where messages are directly posted to friends' newsfeed and can be liked or commented directly, we have shaped the environment to our advantage. Also, this environment change can be perceived by Facebook users as a change from a public environment (a Facebook brand's page) to a private place (the fake profiles' timelines). This is because users act as if their personal spaces on online social networks (newsfeed, timelines) are private.[57] By seeding to a selected set of engaged fans through Facebook timelines instead of a distribution on Facebook pages, we have optimized our seeding strategy on Facebook.

Results

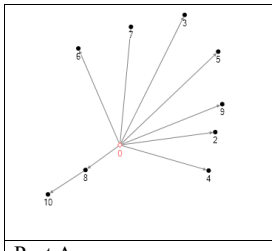
On our profiles' timelines, forty people rapidly engaged with the six published posts by liking or commenting on them. In the graphs below, we label our profiles "0" and "1" and the likers/commenters with numbers 2 to 40 and draw the social graph for each published post. We label our posts A to F. For Three of the statuses (B, D & E), each one of our profiles automatically likes or comments on the post of the other profile acting as a bridge between both social networks (his friends and the other profile's friends). These graphs show the engagement on each post of our profiles' friends, who represent our initial seeding population and are fans of the brand's page. We notice that some posts create more engagement than

55 M. Bernstein, E. Bakshy, M. Burke, B. Karrer, *Quantifying the invisible audience*, op. cit.

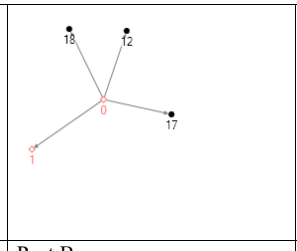
56 C. Heath, D. Heath, *Switch: How to Change Things When Change Is Hard*, New York 2010.

57 E. Bassett, K. O'Riordan, *Ethics of Internet research: Contesting the human subjects research model*, "Ethics and Information Technology," 2002, pp. 1-16.

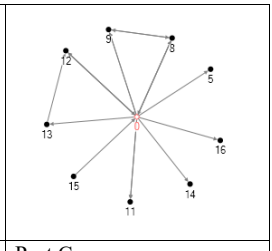
others, mainly C, D & E. In these posts, friends (or brand's fans) not only engage with our created profiles but also with each other. For instance, in post D, friends 11, 36, 37 and 15 engage with each other in a discussion creating a connection between the friends of profile "0" and the friends profile "1" and opening a new channel of discussion.



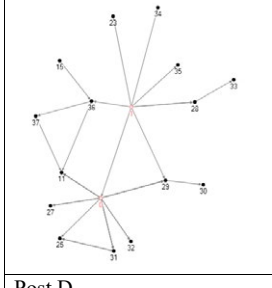
Post A



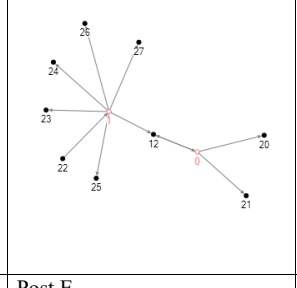
Post B



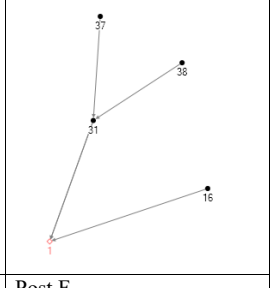
Post C



Post D



Post E



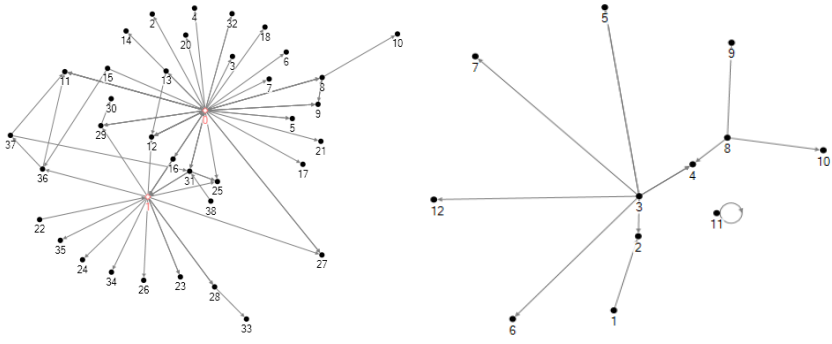
Post F

We evaluate the success of our method by combining the communications of all six posts on our fake profiles' timelines in one graph and determine the metrics of the resulting graph using NodeXL[58]:

- There is one connected component meaning that both profiles generated one larger network of communication and influence or—as the graph shows—involved both networks in the same communication and acted as bridges between two sub-networks who react differently (we mentioned that our profiles have only 30 friends in common (around 10% of the total population of attracted fans). A deeper analysis showed that 33 engagement actions (comments/like) where made on the statuses or comments posted by one of our profiles and 44 engagement actions were made on the statuses or comments made by the other profile.
- 14.8% of edges (connections) are reciprocated showing that communication went back and forth between brand-engaged fans.

58 D. Hansen, B. Shneiderman, M. Smith, *Analyzing social media networks*, op. cit.

In comparison, the same 6 posts on the company's page had significantly less interactions:



The following table shows the difference between the two strategies:

	Negative posts published on the brand's Facebook page	Same negative posts published on fake profiles timelines using an optimized seeding strategy	Difference
Fans engaged	11	37[59]	+236%
Engagement actions (likes, comments)	15	77	+413%
Reciprocation (back and forth communication and consumer to consumer communication)	0%	14.8%	+14.8%

Comparison of Facebook engagement using posts on the brand's Facebook page and using a seeding population on Facebook timelines

The experiment showed that it is possible to attain higher engagement by targeting a small group of highly interacting fans on one or more Facebook personal profile rather than targeting the whole population of fans on the Facebook page of the brand. Using this technique, we were able to engage 236% more fans and generate 413% more WOM actions. This confirms the potential of this technique as an efficient NWoM marketing and e-reputation tool.

59 Not including our profiles.

Implications for WOM

From a theoretical perspective, our experiment is consistent with the findings of Watts and Dodds[60] that large cascades of influence are driven by a critical mass of easily influenced people. We also contributed to the knowledge of the role of the initial seeding population. Indeed, a determinant factor in diffusing information on online social networks is the choice of the initial seeding population[61] especially with Facebook gradually decreasing the organic reach (free distribution) of brand's statuses and posts. These findings confirm that using an optimal seeding population as a seeding strategy results in higher WOM and influence.[62] Most importantly, we mentioned earlier in this paper that scholar suggest four critical viral marketing success factors: Content, structure of the social network, behavioral characteristics of the recipients and their incentive, and the seeding strategy.[63] At the end of this experiment, we suggest to add a fifth factor to the Hinz et al.'s list: the carrier. We know that consumers actively avoid traditional marketing methods and engage with peer and user-generated content.[64] These findings are confirmed by Sprague and Wells[65] who have observed a deeper impact of communication when the consumer perceives the source of the information as not being a marketer In this experiment, the messengers have been be direct "friends" or "friends of friends."

The role of the messenger has previously been identified as a key to WoM success.[66] Valente et al.[67] consider that "the messenger is the message," suggesting that the message carrier's role in the diffusion may be even more important than the content of the message itself. Laczniak et al.[68] also suggests that receivers' attributions depend on the manner in which negative WoM is conveyed and that the source of information impacts the level

60 D. Watts, P. Dodds, *Influentials, networks, and public opinion formation*, op. cit.

61 Y. Liu-Thompkins, *Seeding viral content*, op. cit.

62 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure*, op. cit.; Y. Liu-Thompkins, *Seeding viral content*, op. cit.

63 O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.

64 (Hann et al., 2008; O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.

65 R. Sprague, M.E. Wells, *Regulating Online Buzz Marketing: Untangling a Web of Deceit*, "American Business Law Journal," 2010, 47, pp. 415-454. DOI: 10.1111/j.1744-1714.2010.01100.x.

66 Y. Liu-Thompkins, *Seeding viral content*, op. cit.; T.W. Valente, R. Myers, *The Messenger is the Medium*, op. cit.

67 T.W. Valente, R. Myers, *The Messenger is the Medium*, op. cit.

68 R.N. Laczniak, T.E. DeCarlo, S.N. Ramaswami, *Consumers' Responses*, op. cit.

of influence. Sprague and Wells[69] also found that customer-to-customer messages generate more trust, interactions and WoM.

Finally, our experiment suggested an innovative method that can be used on Facebook to control all five essential elements for a successful communication that would significantly increase negative WOM. This method can be reused by marketers and researchers to have a deeper understanding of the inner workings of negative WOM on Facebook. Malevolent attackers could use this method to circumvent standard prevention methods, like banning fans from a page or locking the brand's page for comments and posts. The usage of this type of information vector should be investigated more closely as a model of diffusion but also as a dangerous diffusion model to be aware of in case of e-reputation attacks.

We believe that this strategic approach that has, to the best of our knowledge, never been studied from a marketing perspective could define new methods and techniques to efficiently target and influence communities, control the flow of information to different subset of the community at different times. For example, a marketer could target satisfied customers with a message and unsatisfied customers with another. He could also choose to target a specified number of users at a given time and then wait before sending the same group a second message. He could also use the same technique to benchmark the effect of a message on different communities.

Limitations and future research directions

This experiment showed that grouping engaged users and diffusing information organically to an optimized seeding population results in higher interaction and engagement.

Our approach and its methods may raise two ethical questions: we have performed a malevolent attack against a company (1) and the subjects were not aware of the experiment (2). Regarding the first point, the General Manager of the company knew about the experiment and was its sponsor. He also followed the whole process closely.

Regarding the second point, we mainly republish existing messages to a subset of the population that was initially targeted by those messages. We have just enhanced the distribution and WoM of existing messages without modifying their content. In this matter, Hey[70] states that there is

69 R. Sprague, M.E. Wells, *Regulating Online Buzz Marketing*, op. cit.

70 J.D. Hey, *Experimental economics and deception: A comment*, "Journal of Economic Psychology," 1998, 19, 397-401. DOI: 10.1016/S0167-4870(98)00013-0.

a big difference between telling a lie and not telling subjects about one or more elements of the research. For him, withholding information does not necessarily constitute deception.

On another hand, the main element we concealed was the fact that our profiles were fake. Such practices are not uncommon on Facebook and, even Facebook itself is performing sociological experiments on its users to test their reactions.[71] Different tests conducted on blog members' participation by Hudson and Bruckman[72] showed that people are much less likely to act naturally if they are aware of the experiment. They also discuss the bystander effect in such cases, meaning that people would rather wait for others to help.[73] By disclosing the nature of our fake profiles, we would have discouraged people from befriending them or engaging with their posts. We believe that information diffusion on online social networks will evolve with time and that companies, brands, and public figures should understand the methods that may be employed and use them to their advantage, or protect themselves from malevolent attacks. This experiment provides scholars a framework for understanding how firms can be discredited on Facebook using this technique and enables them to understand, use and, eventually, imagine ways to counteract this special type of communication vectors.

This experiment draws methodological and theoretical lessons that can also be discussed. While most experiments on Facebook revolve around the idea of a network of friends or acquaintances, we have transformed engaged users into friends. In our approach, we look at a Facebook profile not only socially but also strategically. Our fake profiles attracted an initial seeding population of engaged fans, initiated a reaction by diffusing information and worked as a vector in the network to increase the rate of fans' actions.

This experiment also draws some legitimate questions: knowing that the described method increases negative WoM, how does it really affect sales or trust in the brand? Also, with negative WoM being 14 times less influential when it comes to purchase probability[74] can this method be used

71 E. Bakshy, I. Rosenn, C. Marlow, L. Adamic, *The role of social* networks, op. cit.; N. Lee, *Facebook used you like a lab rat and you probably don't care*, Engadget International Editions, 2014, http://www.engadget.com/2014/07/01/facebook-experiment.

72 J. Hudson, A. Bruckman, *Using empirical data to reason about internet research ethics*, ECSCW 2005.

73 J.M. Hudson, A.S. Bruckman, *The Bystander Effect: A Lens for Understanding Patterns of Participation*, "Journal of the Learning Sciences," 2004, 13, pp. 165-195. DOI: 10.1207/s15327809jls1302_2.

74 R. Vázquez-Casielles, L. Suárez-Álvarez, A.B. del Río-Lanza, *The word of mouth dynamic: How positive (and Negative) WOM drives purchase probability: An analysis of interpersonal and non-interpersonal factors*, "Journal of Advertising Research," 2013, 53, pp. 43-60. DOI:10.2501/JAR-53-1-043-060.

with positive WoM as a marketing or advertising strategy? These questions are left for future research or experiments.

Conclusion

Information diffusion on Facebook can be hazardous, uncertain and cause unexpected results especially if marketers focus on the message only. Diffusion success and virality depend on four other important elements: the social structure of the network,[75] the behavior characteristics of the recipients and their incentives for sharing or receiving the message,[76] and the seeding strategy which determines the initially targeted population.[77] To these four elements, we have added the messenger himself[78] as an element of viral marketing success. Many scholars agree that the key to success in information diffusion is influencing the influencer[79] or even influencing a critical mass of easily influenced individuals[80] and using strategy to target an optimized initial seeding population.[81] Also, the information of peers tends to be more contagious than the information diffused by brands or similar source[82] and diffusing negative information to an optimized seeding population of consumers on a profile page results in a much higher negative WoM than diffusing the same information on the brand's page.

This paper exposed a technique that malevolent attackers could use to control the elements of viral marketing on Facebook and use them to increase diffusion of negative WoM. Companies, governments and people should worry about such strategies that could be used on online social networks, in this case, Facebook, to increase negative WoM generated by fans and hurt their online reputation.

75 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure*, op. cit.

76 J. Arndt, *Role of product-related conversations*, op. cit.; Y. Liu-Thompkins, *Seeding viral content*, op. cit.

77 M. Bampo, M.T. Ewing, D.R. Mather, D. Stewart, M. Wallace, *The Effects of the Social Structure*, op. cit.; Y. Liu-Thompkins, *Seeding viral content*, op. cit.

78 T.W. Valente, R. Myers, *The Messenger is the Medium*, op. cit.

79 A. Galeotti, S. Goyal, *Influencing the influencers: a theory of strategic diffusion*, "The RAND Journal of Economics," 2009, 40, pp. 509-532. DOI: 10.1111/j.1756-2171.2009.00075.x.; O. Hinz, B. Skiera, C. Barrot, J. Becker, *Seeding strategies for viral marketing*, op. cit.

80 D. Watts, P. Dodds, *Influentials, networks, and public opinion formation*, op. cit.

81 Y. Liu-Thompkins, *Seeding viral content*, op. cit.

82 T.W. Valente, R. Myers, *The Messenger is the Medium*, op. cit.; D. Watts, P. Dodds, *Influentials, networks, and public opinion formation*, op. cit.

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