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Replication

The impact of content sentiment and emotionality on content virality

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ABSTRACT

Analyzing the most e-mailed *New York Times* (NYT) articles, Berger and Milkman (2012) (BM) found that content virality is positively associated with its positivity and emotionality (particularly with the emotions anger, awe, and anxiety) and negatively related to sadness. Using a sample of German articles, we replicated their study for the most e-mailed article list of Germany's leading news magazine and extended the analysis to (1) three additional communication channels and (2) the non-linear relationship between positivity and virality. Although we could not replicate all the effects uncovered by BM, our findings are consistent with their results across all communication channels. Further, we suggest that the relationship between positivity and virality follows an inverted U-shape pattern and is thus non-linear.

1. Introduction

As digital content continues to proliferate, researchers have taken an increasing interest in how sentiment and emotions affect the word-of-mouth (WOM) diffusion of said content. While communication research generally states that negative news earns more attention (Galtung & Ruge, 1965), there remains an open question regarding whether negative content will then also generate more cross-media traffic via social sharing. For example, Hansen, Arvidsson, Nielsen, Colleoni, and Etter (2011) found that "Tweets" containing negative news are more likely to be re-tweeted, but the popularity of non-news "Tweets" relates more to the content's positive sentiment. In a series of laboratory experiments, De Angelis, Bonezzi, Peluso, Rucker, and Costabile (2012) showed that people tend to generate positive WOM about their own experiences but tend to transmit negative WOM about the experiences of others. Likewise, Barasch and Berger (2014) concluded that people tend to broadcast self-promoting content. In an analysis of the *New York Times*' (NYT) list of most mailed articles, Berger and Milkman (2012) (hereafter BM) found that positively and emotionally written articles are more viral (i.e., are more likely to be shared) and confirmed the causality of their findings via laboratory experiments. In a later study, Milkman and Berger (2014) found that people are more likely to share positively and emotionally written summaries of scientific discoveries with their peers. In this study, we examine whether these findings hold in a different cultural context and across different communication channels.

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2. Data

We collected information on all *Spiegel Online* (SPON) articles that appeared on the magazine's webpage (www.spiegel.de) between March 1, 2012, and September 30, 2012 (27,375 articles). *Spiegel* is the leading German news magazine and one of the largest publications of its kind in Europe. Using web crawlers, we recorded each article's title, link to the full text and the publishing date, as well as the number of Tweets (Twitter), Likes (Facebook) and One-Ups (Google+, available since July 2012) that the article accumulated in the first two weeks of publication. Similar to the NYT, SPON continually reports which articles made it to the top list of e-mail recommendations. We collected retrospectively data about their top lists published during our research time frame using the Internet Archive (https://archive.org/index.php) and matched this information with our other data.

Following BM, we excluded all video content and images without texts (like "Picture of the day") from our sample. Additionally, we excluded blogs, live tickers, articles related to comics and jokes, and articles that are no longer available for further textual analyses, like press conferences and livestream news. Our final data set consisted of 21,676 SPON articles.

3. Article coding

Like BM, we used the automated sentiment analysis tool LIWC (Pennebaker, Roger, & Francis, 2007) (in our case, the German language version) to quantify the positivity and emotionality of the articles in our sample. Positivity is understood as the difference between the percentages of positive and negative words in the article by BM. Emotionality is quantified as the percentage of all positive and negative words in the article by BM.[2]

In order to replicate BM's results for specific emotions and content dimensions, we manually coded a random sample of 310 articles (about 1.5%) following BM's guidelines (available on www.marketingpower.com/jmr_webappendix). Two coders, blind to the research question, were asked to rate articles on the dimensions anger, awe, sadness, anxiety, interest, surprise, and practical utility, each one assessed via a five-point Likert scale. The inter-rater reliabilities were moderate (weighted Cohen's Kappas were between 0.53 and 0.74; see Table 1 in Appendix), but acceptable. We averaged scores across coders and standardized them.

Further, we controlled for the different web page locations (see Fig. 1 in Appendix). Articles are positioned most prominently in the teaser section, followed by the top-featured articles section and the different category sections. Within these three sections, some articles can take the first position, appearing with a text teaser and often with accompanying images. Over time, these articles move down the list, appearing as bullet points until they eventually disappear from the landing page. On this point, we also controlled for the amount of time an article spent on the landing page; 4346 articles were not published on the landing page, but only in subsections. Additionally, we included a control for an article's appearance in the physical magazine. The layout of SPON's website did not change during our observation period.

Using indicator variables for both the time and location of each article's online appearance, we created controls for the month (6 indicator variables), weekday (7 indicator variables), time of day (6:00 a.m.–6:00 p.m. or 6:00 p.m.–6:00 a.m.), and the various sections. We also used an indicator variable that captured whether the first author was male or female; 2301 articles did not feature author information. Next, we controlled for the authors' fame as measured by Google Search hits (up to October 1, 2012). In cases of missing author information, we set the author's fame to the median value. Because author's fame is heavily skewed, we used a logarithm; to prevent the loss of observations due to this transformation (zero search hits), we added 1 to each author's number of search hits. We measured author's writing complexity using the Flesch Reading Ease test (Flesch, 1948), which was performed by an automated analysis tool (see Table 1 in the Appendix for summary statistics). Tables 1 and 2 show the correlation matrices. The correlations between the different dimensions of emotions were quite low, indicating that they obviously measured different things.

4. Estimation results

4.1. Most e-mailed list

The estimation equation for the most e-mailed list of articles looks as follows:

$$\text{Prob}(\text{Most emailed}_i = 1|\boldsymbol{x}_i) = \frac{1}{1 + e^{-(\boldsymbol{x}_i'\boldsymbol{\beta}+\varepsilon)}}$$

We estimated a logistic regression using robust standard errors to account for heteroscedasticity. Model 1 in Table 3 presents our estimation results. The Wald test shows that at least one of the independent variables is not equal to zero ($p < .01$).

We found a positive relationship between an article's positivity and virality ($p < .01$), confirming BM's findings (see first column of Table 3). With respect to the hand-coded dimensions, we found that anger-inducing content ($p < .10$) and practically useful content ($p < .05$) are more likely to be shared via e-mail with peers.

[2] In order to assure the reliability of LIWC, a research assistant coded 183 articles by hand and rated their degree of positivity and emotionality on a 7-point Likert scale. We obtained $r = .49$ ($p < .001$) for positivity and $r = .15$ ($p < .05$) for emotionality. From this, we concluded that LIWC should be sufficient for our purpose.

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