

Winter March 10, 2014

# Towards understanding social influence in on-line social networks

Jerzy Surma, *University of Massachusetts - Lowell*  
Małgorzata Rószkiewicz  
Jacek Wójcik

# Towards understanding social influence in on-line social networks

Jerzy Surma

Department of Management Systems  
Warsaw School of Economics  
Warsaw, Poland  
e-mail: jerzy.surma@sgh.waw.pl

Malgorzata Roszkiewicz

Department of Statistics  
Warsaw School of Economics  
Warsaw, Poland  
e-mail: m.roszki@sgh.waw.pl

Jacek Wojcik

Department of Marketing  
Warsaw School of Economics  
Warsaw, Poland  
e-mail: jwojci@sgh.waw.pl

**Abstract**—On-line social network sites provide an excellent platform for studying social influence among on-line friends. One of the crucial factors in analyzing social influence is conformity. Conformity can be defined as the act of matching attitudes, beliefs, and behaviors to group norms. This paper analyzed the level of conformity of 175 Facebook users, mostly college students, through an experimental study using the Facebook Graph API protocol and a follow-up user survey. The study was designed as an exploratory-based research relying on factor analysis. We discovered that a high level of posting activity on Facebook is positively related to the subject conformity.

**Keywords**—On-line Social network analysis, social influence, conformity.

## I. INTRODUCTION

Identifying peer-to-peer influence on social network sites is critical to new social media marketing strategies [1]. In the past, social influence mechanisms were deployed by companies to develop advertising messages for mass media. Showing people who somehow resemble the message's recipient, or on the contrary – members of a group to which the recipient aspires, can be perceived as an example of the use of social influence mechanisms. Currently, it is possible to customize advertising messages, based on the given consumer's level of conformity to social influence. Social relationships maintained by the users in on-line social networks to a large extent reflect their personal relationships maintained in the real world. Users perceive other participants as a source of information and aim at identifying with the group [2].

In the next section, we provide a short overview of the related works. In the third section, we discuss our methods of empirical data gathering and provide background information on the research group and variables included in the pilot study. The results yielded by the analysis of empirical data are presented in the fourth section. The final section discusses our conclusions and elaborates on potential future research.

## II. RELATED WORK

The role of conformity in social influence studies was described extensively in [3]. Social influence in on-line social networks was widely discussed in the Aral's papers [1], [4]. The crucial problem is the econometrical identification of

social influence, in the case of which separation of correlation from causation in networked data is complicated [5]. In light of the current social media marketing challenges the focus switched to digital word-of-mouth (WoM) communication or consumer-to-consumer campaigns. The new stream of research includes, for example, viral advertising or marketing buzz campaigns. This research stream focuses on marketing techniques that use social networks to increase brand awareness or to achieve other marketing objectives through self-replicating viral processes, analogous to the spread of viruses [6].

## III. RESEARCH DESIGN

The empirical data required for our research are based on two sources. The first one is Facebook, used to collect information on individual activity and interactions with friends on this social network site. The second source of data is a survey identifying the conformity level of all the experiment participants.

### A. Social Network Site Data

A restricted access to Facebook data is enabled by Graph API, which is officially supported by Facebook and presents a simple, consistent view of the Facebook social graph, uniformly representing objects in the graph (e.g., people, photos, events, and pages) and the connections between them (e.g., friend relationships, shared content, and photo tags). In spring 2011, the Warsaw School of Economics students were invited to participate in a research experiment by answering the survey questions and giving permission for a continuous access to their Facebook accounts required by the Graph API protocol. After a two week advertising campaign (e-mails, newsletter, student's journals, etc.) we received a positive response from 272 Facebook users. The gathered data were anonymized and the whole study was organized in the way to avoid selection bias in study participation. Our research is based on 175 active users having the following characteristics (based on the survey answers): age (18-26 years old) – 71%, sex (men) - 51 %, education (college student) – 75%, location (city with a population of more than 1 million) – 72%. Moreover, thanks to the API graph functionality, we gained access to 47,817 accounts of friends of the research group members. We started to download all available data

provided by Graph API, excluding chat conversation data, from June 2011 to December 2012.

TABLE I. VARIABLES CALCULATED FROM FACEBOOK

| Facebook Variable | Description   |
|-------------------|---|
| S2S               | The count of all statuses, updates, photos, videos, links, check-ins, and other objects, that the subject posted on their own Facebook "wall" |
| S2O               | The number of posts that the subject posted directly on friends' profiles   |
| O2S               | The number of posts that the subject's friends posted directly on the subject's profile   |
| Likes             | The total number of "likes" obtained by the content posted by the subject   |
| Comments          | The total number of comments on the content posted by the subject.  |
| NoOfFriends       | The total number of friends of the subject  |

Employing such an approach, we were able to categorize the data obtained from the Facebook Graph API tool into six variables, as presented in Table I. The first five variables represent "write" interactions between specific subjects and their friends.

### B. Survey Data

In order to calculate conformity, we conducted a survey with all the 175 subjects that agreed to participate in our study. The questionnaire included in the survey was designed to reflect actual circumstances and situations to which our experimental group could relate. We elaborated set of statements that drive human behaviors in social relationship-oriented situations. Conformity occurs when an individual adjusts their opinion or conduct to the reactions of other people. It is a response to the two main needs that dominate in social relationships: the need to "be right" and the need to "gain acceptance and favor". These two needs may be satisfied when an individual subjects their reactions to the reactions of the majority. Such behaviors are commonly referred to as conformity [7]. The mere presence of others initiates readiness to subordinate one's actions. The will to subordinate becomes even stronger when an individual is uncertain of the type of reaction that is required in a given situation and when they have negative perception of their competences. The five statements included in the survey were derived from selected mechanisms of conformity are presented in Table II.

TABLE II. CONFORMITY SURVEY QUESTIONS

| No. | Statement  |
|-----|--|
| 1   | I join popular groups on social network sites                              |
| 2   | I always speak my mind, even if I represent an unpopular opinion           |
| 3   | When going to a party, I always dress to feel comfortable in a given group |
| 4   | I'm the first to greet encountered people                                  |
| 5   | I like to follow music charts and listen to the most popular songs         |

The declarative answers obtained through questionnaire survey made it possible to determine the level of the participants' susceptibility to conforming behaviors. Reference [8] presents detailed analysis and justification for survey statements. Each survey statement was followed by a response according to the 4-point Likert scale. Based on those numerical responses, the aggregated Conformity variable was defined. The Cronbach Alpha measure of reliability for this construct is 0.35, which proves the potential validity of our survey statements.

## IV. EMPIRICAL RESULTS

The analysis of our empirical data is based on a two-step exploratory research. Firstly, thanks to factor analysis we were able to identify crucial factors among Facebook variables that determine conformity. Secondly, we verified those factors by means of a regression analysis.

### A. Factor Analysis

We applied a factor analysis to examine variability among observed Facebook variables described in Table I, in terms of a potentially lower number of unobserved variables called factors. The results of this analysis for the Conformity variable are presented in Table III. The Kaiser-Meyer-Olkin measure of sampling adequacy tests is 0.758 and is satisfactory. Two factors were indentified:

1. Factor 1 based on: O2S, S2O, Likes, NoOfFriends
2. Factor 2 based on: S2S, Comments

These two factors represent 73.982% of a total variance and 60.518% of a total variance after Varimax rotation procedure. This proves that factor analysis results are statistically acceptable.

TABLE III. FACTOR ANALYSIS FOR THE CONFORMITY VARIABLE

| Facebook Variable | Factor 1    | Factor 2    |
|-------------------|-------------|-------------|
| O2S               | <b>.613</b> | .098        |
| S2O               | <b>.670</b> | .486        |
| S2S               | .056        | <b>.773</b> |
| Comments          | .476        | <b>.786</b> |
| Likes             | <b>.694</b> | .585        |
| NoOfFriends       | <b>.529</b> | .102        |

Factors are indicated by numbers in bold

The first factor has not got a clear interpretation. The second one, which is statistically much stronger, has a straightforward interpretation. It represents a high posting activity in terms of status updates, photos, links, etc., additionally those posts generate a high response from the user's friends.

### B. Regression Analysis

The factor analysis results were verified by a linear regression analysis and are presented in Table IV. Both factors have a strong statistical significance, 0.5 and .01 respectively. It means that the posting activity is highly and positively related to the subject conformity level.

TABLE IV. REGRESSION ANALYSIS FOR THE CONFORMITY VARIABLE

| Variable               | Result            |
|------------------------|-------------------|
| Factor 1               | .195**<br>(.073)  |
| Factor 2               | .321***<br>(.085) |
| Number of observations | 175               |
| R                      | .352              |
| R <sup>2</sup>         | .124              |
| F statistic            | 12.191            |

Numbers in parentheses are standard errors. Constant was omitted. \*p < .1 \*\*p < .05 \*\*\*p < .01 in a two-tailed test

## V. CONCLUSIONS

This preliminary research brought very interesting results. According to our analysis, subject conformity is highly related

to posting activity. Moreover, such posts generate a substantial friends' reaction. It means that people with a high conformity level are trying to draw attention on themselves. In the context of interactions with friends, we can observe a kind of an impression management approach, i.e. the attempt to control information in order to affect other opinions of us [9]. The main objective of the user's actions is to provide the audience with an impression consistent with the desired goals of the actor.

Unfortunately, those results are very tentative. Firstly, the conformity level is based on the survey, thus it is something declared by subjects. Secondly, we were not able to adequately control the regression analysis and that is why our findings require a more strict evaluation. Moreover, we would like to underline that this is an exploratory research and that the next step will require a theoretical background that will allow us to manage this research adequately.

### ACKNOWLEDGMENT

This research was financially supported by National Science Centre in Poland NCN (HS4/06630/13). We would like to thank warmly Dawid Pacha and Mateusz Chrzest for their useful support in data collection.

### REFERENCES

- [1] S. Aral, D. Walker, "Identifying Social Influence in Networks Using Randomized Experiments", *IEEE Intelligent Systems*, vol. 26(5), 2011, pp. 91-96.
- [2] M. Deutsch, H.B. Gerard, "A study of normative and informational influence upon individual judgment", *Journal of Abnormal and Social Psychology*, vol. 51, 1995, pp. 629-636.
- [3] R.B. Cialdini, N.J. Goldstein, "Social influence: Compliance and Conformity", *Annual Review of Psychology*, vol. 55, 2004, pp. 591-621.
- [4] S. Aral, D. Walker, "Identifying Influential and Susceptible Members of Social Networks", *Science*, vol. 337(6092), 2012, pp. 337-341.
- [5] S. Aral, "Identifying Social Influence: A Comment on Opinion Leadership and Social Contagion in New Product Diffusion", *Marketing Science*, vol. 30(2), 2011.
- [6] M. Trusov, A.V. Bodapati, R.E. Bucklin, "Determining Influential Users in Internet Social Networks", *Journal of Marketing Research*, vol. 47(4), 2010, pp. 643-658.
- [7] R. Bond, P.B. Smith, "Culture and Conformity: A Meta Analysis of Studies Using Asch's Line Judgment Task", *Psychological Bulletin*, vol. 119, 1996, 111-137.
- [8] J. Surma, L. Motiwalla, M. Roszkiewicz, J. Wojcik, "Social Network Sites a Source of Customer Behaviors", *The Twelfth Workshop on E-Business (WEB 2013)*, Chicago, August 15, 2013.
- [9] Y. Amichai-Hamburger, G. Vinitzky, "Social network use and personality", *Computers in Human Behavior*, vol. 26(6), 2010, pp. 1289-1295.