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Comparing Friendship vs Communication Networks among Members of Politically Motivated Online Groups

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Introduction

When analyzing online groups and their interactions, network researchers often rely on one of the two types of social network data: (1) a Friendship network ('*who is a friend with whom*') or (2) a Communication network ('*who interacts or communicates with whom*'), but rarely both. And depending on the type of social network data researchers have access to, researchers can reach very different conclusions about the group being studied. To ensure that we can get a more accurate understanding of group dynamics on social networking sites, this study will examine and compare both friendship and communications network ties formed on VKontakte (VK), a popular social networking site in Eastern Europe. Specifically, the study will explore whether there are differences between friendship ties and communications ties formed among members of public groups on VKontakte and how those differences may affect our understanding of these online groups. In particular, we want to know if there is a positive or negative correlation between the friendship and communication networks.

As alluded to earlier, most prior studies on online groups have primarily focused only on one type of social network data. As a result, there is a lack of understanding about the exact nature and a possible relationship between friendship and communication ties. Our work is building on some initial research in this area by Haythornthwaite & Wellman (1998), Cho et al. (2007), Huberman et al. (2008), Gruzd, A. (2009), Ledbetter & Kuznekoff (2012), Bohn et al. (2014), Welles et al. (2014), Guo, Pathak, & Cheng (2015), Grunander (2016), but here we will apply it to the context of politically-focussed online groups. Specifically, in this paper we examined four online groups with distinct points of views on the ongoing conflict between Ukraine and Russia; two of the groups supported the 2014 Euromaidan revolution in Ukraine (further referred to as 'Pro 1' and 'Pro 2') and two opposed the revolution ('Anti 1' and 'Anti 2'). The groups are hosted on VKontakte (or VK for short), one of the most popular social networking sites in Ukraine and other former Soviet Union republics, with over 350 million registered users.

We chose these groups because (1) they are public; anyone can join, post and reply to other's messages, and (2) the subject matter of their discussion, the crisis in Ukraine and the conflict between Ukraine and Russia, tends to elicit strong feelings for or against. As the conflict in Ukraine is still ongoing and tensions are high between opponents both offline and online, these groups became common spaces for online users to discuss news, politics, share information about local and global events, and find likeminded individuals to connect. This makes these groups ideal candidates to find out whether members would primarily communicate with their VK "friends" as a mechanism to avoid confrontation and attacks; or whether they would be more likely to engage contrary minded participants directly. If the former is true, then we would expect some correlation between the friendship and communication network. On the one hand, since each of these groups has explicitly identified themselves as belonging to one side or another, we could expect that most of the conversations in the group happen among friends; thus, there would be a positive correlation between the friendship and communication networks. On the other hand,

since these groups are public and anyone can post, comment or like their content, we may see a disconnect between the corresponding friendship and communication networks, especially if the groups attract contrary minded individuals who may try to disrupt group's discussions and start a fight on its pages.

This paper is an extension of our previous study on the same four VK groups in 2014 (Gruzd & Tsyganova, 2015), which demonstrated that the friendship ties in these groups were largely driven by the geographical location of their members. In that earlier study, we showed that two group members were more likely to be friends on the website if they were located in the same city. The current work attempts to go further by trying to understand the relationship between friendship and communication ties among members of these groups.

Method

Using VK's public Application Program Interface (API) and a custom program, we collected publicly available data for each of the four VK groups, including friendship and posting data from 2015 (one year after the Euromaidan revolution in Ukraine). Table 1 shows the size of each group in terms of the number of members, the number of users who posted or liked something in the group, the number of friendship ties, and the number of communications ties (accounting for both *who replies to whom* and *who likes whose posts*). Since the groups are public, non members can also post, comment or like something in a group. Therefore, for some of the groups the number of posters is higher than the number of actual group members, and the communication networks have more ties than the corresponding friendship networks.

Table 1. VK Groups' Network Properties

Group	#Members	#Posters	#Friendship Ties	#Communication Ties
Pro 1	145,418	518,928	388,876	133,1245
Pro 2	89,431	17,869*	220,719	32,096
Anti 1	122,161	310,488	625,450	1,701,645
Anti 2	151,521	666,553	780,338	1,182,235

*A relatively low number of posters in Pro 2 can be explained by a number of factors: (a) one possibility is that due to the informational nature of this group it generally attracted fewer conversations; (b) another possibility is that since the datasets were collected retroactively, some discussion threads might have been deleted by the moderators. This is something that we will investigate in our future research.

Once the datasets were collected, the next step was to compare the two types of networks: friendship and communication. To do so, we decided to focus on networks derived from individual threads (as opposed to the overall network representing interactions for the whole year). Specifically, to build communication networks, we used four sets of the top ten discussion threads in each group based on the following four criteria:

- the number of comments,
- the number of 'likes',
- the number of contributing users, and
- the number of reposts.

The focus on individual threads allowed us to account for a wide variability of topics and participants in the group. To ensure that each of the four criteria above produces different sets of threads, we calculated the overlap between these sets. The results confirmed that the resulting sets contain mostly non-overlapping threads (see Table 2). In other words, threads that attracted many posters are not necessarily the same threads where posts received the most number of likes or reposts. This confirmed the sets are sufficiently different and are good candidates for a comparative analysis.

Table 2: The Number of Matching Threads Across the Four Sets of the Top Ten Threads per Group

Pro 1 Group

	By Comments	By Likes	By Reposts	By User
By Comments	-	0	1	2
By Likes	0	-	1	0
By Reposts	1	1	-	0
By User	2	0	0	-

Pro 2 Group

	By Comments	By Likes	By Reposts	By User
By Comments	-	1	0	0
By Likes	1	-	3	0
By Reposts	0	3	-	0
By User	0	0	0	-

Anti 1 Group

	By Comments	By Likes	By Reposts	By User
By Comments	-	0	0	1
By Likes	0	-	3	1
By Reposts	0	3	-	0
By User	1	1	0	-

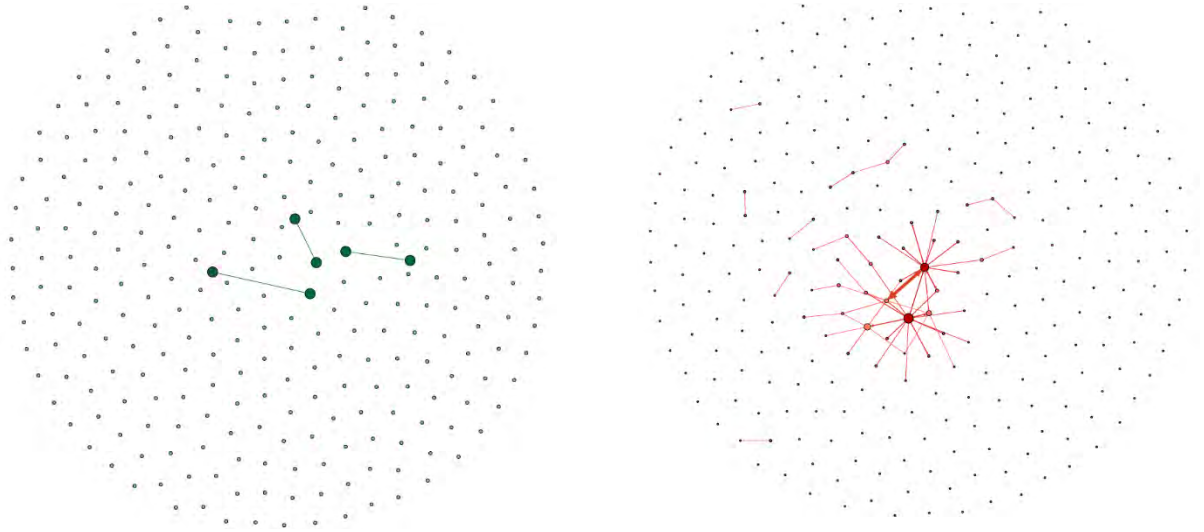
Anti 2 Group

	By Comments	By Likes	By Reposts	By User
By Comments	-	0	0	4
By Likes	0	-	3	0
By Reposts	0	3	-	0
By User	4	0	0	-

Next, for each thread, we used information about '*who replied to who*' to build corresponding communication networks. We also identified who is a friend with whom among group members who contributed to each of these threads. In sum, we ended up with 160 discussion threads (4 top ten criteria x

10 discussion threads x 4 groups), and for each thread we were able to build two types of networks: friendship and communication.

For the purposes of the comparison, we only kept group members who appeared in both of the networks. First, we removed members from the friendship networks who did not interact with others in the group through posts. Second, we removed all visitors who initially appeared in the communication networks, but were not members of the groups. Finally, since friendship ties are undirected and binary (friend or not), we treated the resulting communication networks as undirected and binary as well. Figure 1 shows sample networks for the Anti 1 group for one of the threads.



(a) Anti 1 Friendship Network for Thread #2 (b) Anti 1 Communication Network for Thread #2

Note: Isolated nodes in the networks represent those members who only replied to one or more posts published by the group account or by a group visitor but who did not reply to any other group members in the selected thread.

Figure 1: Anti 1 Friendship and Communication Network Examples

To conduct a pair-wise comparison of the resulting networks, Procedure (QAP) to test correlation between the two network types. For a description of this permutation test, see Thelwall (2004). We we performed the Quadratic Assignment used the 'statnet' library in R to perform the analysis and specifically functions: 'quaptest' and 'gcor'.

Finally, to explain the QAP results, we examined the content of the threads manually as well as automatically by detecting posts with swear words as potential markers of hostile conversations. Even though this provided us with some additional information about the nature of discussions among online participants in different threads, there were no consistent results. Therefore, we decided not to report the content analysis part in this exploratory paper.

Results

In the majority of the tests, 153 out of 160 (or 144 out of 150 if we exclude the overlapping threads), no correlation was found between the friendship and communication networks (see Appendix A).

This suggests that VK friends who are members of the same group are not likely to communicate with each other online. In other words, there are other factors such as the topic of a thread that may explain why group members engage in online discussions.

The fact that VK group members do not engage their VK friends online may be a sign of hostile discussions, as we would generally expect a lower level of hostility between interactions among self-declared friends. If this supposition holds, we may be able to use correlation between friendship and communication networks as an indicator of the level of hostility in an online group. Information like this would be extremely valuable to group moderators who might be able to use such insights to intervene in group discussions as needed.

At the same time, the six unique outlier-threads with a weak to moderate correlation between the two types of networks may be good examples of the types of discussions that stimulate interaction among friends and may lead to strengthening their relationship and group cohesion overall. Our future work will examine the topical focus of each of the outlier-threads to determine what topics are more or less likely to attract discussions among friends; for example, a call for action versus an informational post. By knowing what topics encourage exchanges among friends, a group moderator may purposefully seed and foster such conversations. After all, it may not be enough to convince one's friends to join the group, but it is just as important to encourage their active online participation in the group. Although, it is also important to note that too many discussions among friends may deter newcomers from joining the conversation.

In our future work, in addition to examining the 'replies' network, we will also examine the 'likes' network. Our expectation is that since 'likes' usually suggest endorsements, the 'likes' networks may be more similar to the friendship networks than the 'replies' networks.

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Appendix A. QAP Results: Friendship vs Communication (Replies) Networks

* "N/A" means that one or both of the networks did not contain any edges; as a result, it is not possible to perform the QAP test.

Pro 1 Group

Top 10 By Comments

Thread	Correlation	Significance
1	N/A*	N/A
2	-0.00192	1
3	N/A	N/A
4	-0.00382	0.05
5	N/A	N/A
6	N/A	N/A
7	-0.00123	0.45
8	N/A	N/A
9	N/A	N/A
10	N/A	N/A

Top 10 By Reposts

Thread	Correlation	Significance
1	N/A	N/A
2	-0.00070	1
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A
10	-0.001922	1

Top 10 By Users

Topic	Correlation	Significance
1	N/A	N/A
2	-0.000396	1
3	-0.001236	0.43
4	-0.000367	0.51
5	-0.000155	1
6	0.40808	0.001
7	N/A	N/A
8	-0.00383	0.051
9	N/A	N/A
10	-0.002553	0.19

Top 10 By Likes

Topic	Correlation	Significance
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A
10	-0.00875	1

Pro 2 Group

Top 10 By Comments

Thread	Correlation	Significance
1	N/A	N/A
2	-0.03522	1

Top 10 By Likes

Thread	Correlation	Significance
1	N/A	N/A
2	N/A	N/A

3	N/A	N/A	3	N/A	N/A
4	N/A	N/A	4	N/A	N/A
5	N/A	N/A	5	N/A	N/A
6	N/A	N/A	6	N/A	N/A
7	N/A	N/A	7	N/A	N/A
8	N/A	N/A	8	N/A	N/A
9	N/A	N/A	9	N/A	N/A
10	-0.04607	1	10	N/A	N/A

Top 10 By Users			Top 10 By Reposts		
Thread	Correlation	Significance	Thread	Correlation	Significance
1	N/A	N/A	1	N/A	N/A
2	N/A	N/A	2	N/A	N/A
3	-0.00678	1	3	N/A	N/A
4	N/A	N/A	4	N/A	N/A
5	N/A	N/A	5	N/A	N/A
6	N/A	N/A	6	N/A	N/A
7	0.40148	0.021	7	N/A	N/A
8	N/A	N/A	8	N/A	N/A
9	N/A	N/A	9	N/A	N/A
10	N/A	N/A	10	N/A	N/A

Anti 1 Group

Top 10 By Comments			Top 10 By Likes		
Thread	Correlation	Significance	Thread	Correlation	Significance
1	N/A	N/A	1	-0.01498	1
2	-0.00029	0	2	-0.00282	1
3	0.26226	0	3	N/A	N/A
4	N/A	N/A	4	N/A	N/A
5	N/A	N/A	5	N/A	N/A
6	N/A	N/A	6	N/A	N/A
7	N/A	N/A	7	N/A	N/A
8	N/A	N/A	8	N/A	N/A
9	N/A	N/A	9	-0.00141	0.39

10	N/A	N/A	10	N/A	N/A

Top 10 By Reposts

Thread	Correlation	Significance
1	0.20769	0.003
2	-0.01498	1
3	N/A	N/A
4	N/A	N/A
5	-0.00239	1
6	N/A	N/A
7	N/A	N/A
8	-0.00282	1
9	-0.00169	1
10	N/A	N/A

Top 10 By Users

Thread	Correlation	Significance
1	-0.00029	0
2	N/A	N/A
3	N/A	N/A
4	-0.00029	0.47
5	-0.00063	0.48
6	N/A	N/A
7	-0.00069	0.48
8	-0.00058	0.49
9	-0.00035	0.36
10	-0.0009	1

Anti 2 Group

Top 10 By Comments

Thread	Correlation	Significance
1	-0.00866	1
2	N/A	N/A
3	-0.01849	1
4	0.50669	0
5	N/A	N/A
6	0.22286	0.011
7	-0.00504	0.14
8	N/A	N/A
9	N/A	N/A
10	N/A	N/A

Top 10 By Reposts

Thread	Correlation	Significance
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A
10	N/A	N/A

Top 10 By Users

Thread	Correlation	Significance
1	N/A	N/A
2	N/A	N/A

Top 10 By Likes

Thread	Correlation	Significance
1	N/A	N/A
2	N/A	N/A

3	0.22286	0.008	3	N/A	N/A
4	-0.00191	1	4	N/A	N/A
5	N/A	N/A	5	N/A	N/A
6	N/A	N/A	6	N/A	N/A
7	-0.00208	1	7	N/A	N/A
8	N/A	N/A	8	N/A	N/A
9	N/A	N/A	9	N/A	N/A
10	-0.00504	0.145	10	N/A	N/A