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## The impact of opinion majorities in social networks and the role of digital maturity

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**Abstract.** The emergence of social media platforms like Facebook and their success in connecting people changed not only the way people interact and socialize, but also allows for new forms of spreading opinion. The obstacles to share opinions and reaching many known and unknown others, decreased noticeably, bringing up an abundance of opinions on diverse topics. We investigated the interplay of the spiral of silence and the bandwagon effect in online contexts and performed a web survey with 163 participants, confronting them with opinion majorities in user comments on four diverse topics. Our results show, that both phenomena reoccur in online contexts. However, they were not traceable to our examined user factors. This indicates, that a large proportion of users could fall for online bandwagon effects and the spiral of silence.

**Keywords:** spiral of silence · bandwagon effect · opinion change · opinion majorities · digital maturity · human factors.

## 1 Introduction

The internet simplifies the expression of opinion noticeably, as it gives the opportunity to spread content all over the world with a few clicks. Social media platforms such as Facebook serve as a source of information and possibility to share user content simultaneously [18]. Besides posting about daily life, social networking sites are also used for sharing individual opinions. Here, they introduce some simplifications compared to face-to-face communication due to their online context [5]. Simultaneously, platforms like Facebook are used more frequently by news organizations to share their media content, giving their followers the opportunity to conveniently express their opinion by marking the news post with a likes or commenting on them.

Hence, the topical posts in the users' news feeds are accompanied by a variety of opinions, which can influence the behavior of users regarding their participation in online discussions [16]. Majorities in opinion distributions can trigger the same influential effects as in offline contexts and may lead to silencing minority opinions, although the strength of this effect can differ [19].

In this way, perceptions of public opinion can be manipulated, as social network users are rarely able to verify the authenticity of other users' comments and further factors like the dissemination of disinformation through social bots emerge [20]. Altogether, the user can be tempted to change their opinion based on wrong assumptions, as it possibly happened after the Brexit debate [3].

Our exploratory approach examines the spiral of silence and the bandwagon effect in online social networks with regard to several user factors such as age, gender, personality traits, and social media expertise. In the following, the theoretical background of those effects and their relevance for current political affairs is described.

## 2 Related Work

In terms of opinion majorities, multiple phenomena interact that can influence the user's perception and evaluation of opinions on social network sites (SNS). Current research in particular considers the effects of the so-called *spiral of silence* and the *bandwagon heuristic*, which will be introduced with its relevant factors for our research in the following.

### 2.1 Spiral of silence

The theory of the spiral of silence builds upon the fear of an individual to get isolated from a group with their minority opinion because of nonconformity in relation to the accepted public opinion [15]. This leads to muting divergent opinions of minority groups and enforcing a public opinion that is accepted by the whole group. This effect also occurs in online social networks like Facebook, where the users opinion concerning a topical post can be articulated through comments or reactions. However, there are certain particularities to consider, such as the change of privacy in online-contexts, the role of network size, and the high diversity of available opinions [7, 1420ff]. Kwon et al. found, that social network users in particular are afraid of relationship-specific isolation. They fear *isolation from offline contacts* and *isolation through breaking weak ties* when participating in a political online discussion and being confronted with diverse opinions. They further argued, that their measured willingness to self-censor is mostly determined by the uncertainty about the users opinion rather than of the wish for fitting into the social norm [7, p. 1430].

More concretely, Gearhart et al. state that the effects on opinion expression in social networks are consonant with the theoretical assumptions of the spiral of silence theory, as for example users who perceive more similar minded opinions are more highly motivated to share their own opinion than others who notice predominantly contradictory opinions [4, 27]. Especially related to Facebook, they valued the reactions through likes or comments as either positive or negative influence on the self-censorship of a user. In line with other research, Gearhart et al. stated that if one receives positive feedback repeatedly for his input, they are also more willing to react positively to other users' posts [2]. On the

other hand they discovered, that the use of SNS in general alone increases the user's motivation for opinion sharing and lowers the ignorance of posts. This is interpreted as an effect of the lower perceived privacy in SNS environments [4].

Neubaum et al. investigated the implications of the fear of isolation on the user's attention for opinion cues. In their experiment they found evidence for a higher attention regarding opinions in user comments, when users show a stronger fear of isolation [14]. It could also be shown, that a perceived public opinion was constructed on the basis of user comments rather than on numerical reactions such as Facebook likes of a post. They conclude, that there is a relationship between the perceived user's opinions online and the perception of a public opinion in the real world [14]. Further effects on real world behavior were indicated by Kim, who inferred from the spiral of silence online to less political participation and opinion expression offline, especially for users with low levels of partisan belief [6]. This underpins the relevance for conducting research about the spiral of silence on Facebook, as it seems to gain influence on political participation processes and hereby also might alter the flows in our democracy.

## 2.2 The bandwagon effect

The so-called bandwagon effect was first defined by Leibenstein in 1950 and was referred to as the individual's lower or higher demand of a commodity directly connected to the appropriate demand of all other individuals regarding this commodity [11]. This definition resurfaces in online contexts as for instance, Lee et al. found, that the opinion majorities occurring in social media posts are skewed by the bandwagon effect. This effect shows its impact unattached to a specific topic area [10]. They argue, that the number of comments is utilized by the users for indicating an opinion majority, where not enough time has passed for the rise of an opinion majority.

Sundar et al. could show, that this effect also plays an important role for valuing the credibility of news articles, as users relied more on the articles chosen by other users rather than those chosen by experts [21]. Compared to other criteria for evaluating the quality of a news article, the bandwagon heuristic is competing against the freshness heuristic, which gives higher value to newer articles, and supports the credibility of an article with a sense of external validation [23]. Sundar et al. see this bandwagon heuristic also cued by Web 2.0 features like user-based recommendation algorithms that are used by online retailers and mechanisms for recommending the most shared articles on a news website [22].

Several researchers also examined the influence of the bandwagon effect on voting behavior. An early approach on measuring the mediating effects of the bandwagon was taken by Zech et al., who attested its impact on voters. Holding other influencing factors constant, they showed that users change their vote to a general favored candidate at each cost [26]. More recently, also Morton et al. were able to validate decreased participation and the occurrence of a bandwagon effect for elections depending on prior knowledge of possible outcomes through accessing exit polls. Voters who obtain this additional information about possible favorites during an election tend to be affected either by the bandwagon vote switching

effect and vote contrary to their preferences or by the bandwagon turnout effect and only participate in the vote if their favored candidate is about to win [13].

Van der Meer et al. substantiate these findings by performing a large-scale survey experiment and found that not the result of an exit poll is the decision maker for appearing bandwagon effects, but the accentuation of which candidate is gaining the power to win the vote [12].

In conclusion, also the bandwagon effect plays an important role in democratic decision processes and will therefore be further object of investigation in our research.

### 2.3 Opinion majorities in social media

We want to explore the interplay of the two previously introduced factors with concrete regard to perceived opinion majorities in posts in social networking sites, which arise through polarizing user comments on diverse topical posts. Previous research indicated, that dissonant user comments regarding a news article lead to higher distrust in the reliability of the news article [8], whereas positive comments were not beneficial for the trustworthiness [25].

It was also repeatedly shown, that comments have a higher impact on the reader's evaluation of news articles than the number of likes of a certain post [25, 14], wherefore we concentrated on user comments as influencing factor.

The following chapter will introduce the utilized research methods for obtaining further insights into opinion change behavior on the basis of influential user comments.

## 3 Method

To take a closer look on the previously described effects, we chose an empirical approach and conducted an online questionnaire for examining possible influences on opinion formation.

### 3.1 Online Questionnaire

After giving a brief welcome with stating the survey topic and informing participants about their anonymity and the duration of the questionnaire, the questionnaire started with requesting demographic factors such as age and gender. Afterwards, information about the social media habits and personality traits of our participants were collected. In the second part of the survey, we simulated opinion majorities and evaluated their effect on opinion change of the participants.

The social media habits were investigated by asking the users about their active use of social media services on the basis of six concrete examples (Facebook, Twitter, Instagram, Google Plus, Snapchat, Youtube) and their frequency of social media use in general (providing six answers from *multiple times a day* to *monthly*). In both cases, the users were allowed to give an additional free text answer.

We also wanted to assess the effect of personality on the user behavior in online social networks and therefore measured the Big Five personality traits *extraversion*, *openness* and *neuroticism*. Here, we provided a six-point Likert scale (from 1 = fully disagree to 6 = fully agree) instead of the originally used five-point scale to stay consistent with the previous questions.



**Fig. 1.** Requesting the initial opinion in form of a facebook post

For simulating opinion majorities in the context of online social networks, we chose four concrete questions:

1. Would you pay for using public toilets?
2. Do you agree with a tax reduction for healthy food and a tax rise for unhealthy food?
3. Do you like Cristiano Ronaldo?
4. Do you agree with an obligation for installing smoke detectors in flats and houses?

These questions had the purpose to cover, on the one hand mainly neutral topics for which we expect that no polarized opinions exist. On the other hand, also topics were chosen that could involve clear opinions of the participants.

After a short introduction to our scenario that explained the social media context of the following tasks, a Facebook post was shown to the participants for each question containing a topic-related picture next to the initial question. The question would ask them whether they would agree or disagree with the opinion. Afterwards, these posts were presented again and now consisted of five additional comments from anonymized users.

By referring to their initial opinion, four of the comments contradicted the participants' opinion and only one of them matched it. Here, they were asked to choose the comment which they would most likely agree with. Those comments contained both rational and emotional arguments for and against the particular topic. The order of the comments was randomized for each participant to avoid possible sequence effects.

Finally, the participants had the possibility to leave further comments regarding the questionnaire. Our data was collected in December 2017 in Germany. Participants were acquired by sharing the hyperlink of the survey through mailing lists and social media.

### 3.2 Statistical Analysis

After the survey stage, the collected data was analyzed using IBM SPSS Statistics v24. We wanted to detect opinion changes and also their directions (from agree to disagree or reverse). Group differences were tested using T-tests for independent samples. Besides gender, we also performed group comparisons depending on the frequency of internet use and therefore separated the participants between those who answered to use social media services multiple times a day and the others who stated a lower usage. We chose a level of significance at  $\alpha = .05$ .

The influence of age and the measured personality traits on the opinion change behavior was examined by calculating Pearson correlation coefficients.

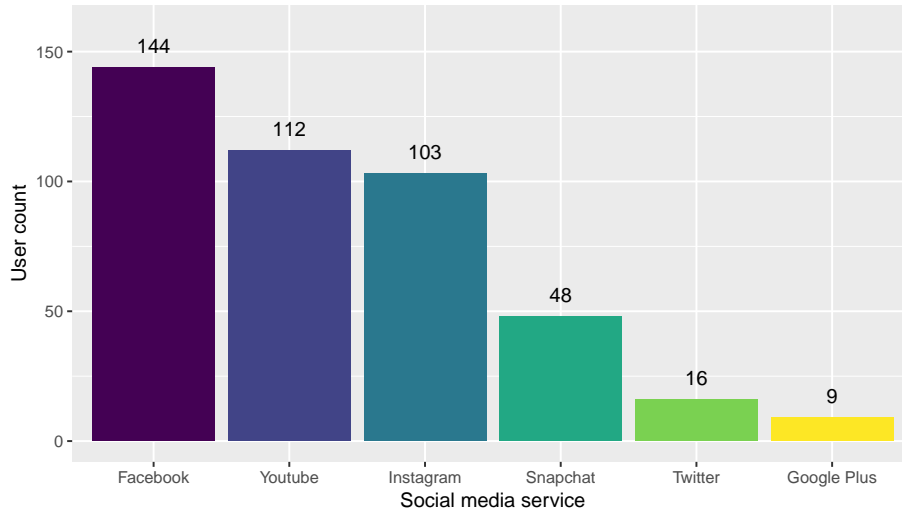
## 4 Results

In order to understand how our participants responded we first look into descriptive statistics to characterize our sample. Next, we test differences and associations using both t-tests and correlations.

### 4.1 Sample description

Our sample comprised of 163 participants in total of whom 60 % were women and 40 % were men. The mean age of the participants was 27.8 years ( $SD = 9.37$ ) with a range from 16 to 77 between the youngest and oldest participant.

Regarding the social media expertise, Facebook was the most used social media service by our participants, followed by Youtube and Instagram (see Figure 2). Each participant indicated to use at least one of the provided services and the mean amount of used services was 2.7 ( $SD = 1.06$ ). 87 % of the sample stated that they are using such services daily or even multiple times a day. Thus, it can be said, that our sample is very experienced in using social media services.



**Fig. 2.** Social Media services used by the participants ( $N = 163$ )

We examined the personality of the participants by using the Big Five BFI-10 item set for the personality traits extraversion, openness, and neuroticism. The corresponding constructs consisted of 2 items each and showed useful reliability coefficients with exception of the construct for openness (see Table 1). Nevertheless, it will be used for further analysis, because the low reliability can be an effect of the imbalance of the sample regarding the age distribution compared to the sample used for standardizing the constructs. The values for extraversion and openness were slightly above the scale mean, whereas the value for neuroticism was subjacent.

**Table 1.** Dispersion and reliability of the Big Five items

	Mean	Standard Deviation	Reliability
Big5 Neuroticism	3.1	1.02	$\alpha = .74$
Big5 Extraversion	4.3	1.02	$\alpha = .73$
Big5 Openness	4.4	0.92	$\alpha = .39$

Concerning the initial opinion of the participants regarding the presented topics, the obligatory installation of smoke detectors gained the highest consistency of opinions. From our participants 88% agreed that it would be useful to make the installation of smoke detectors in flats and houses obligatory, whereas 12% were against it. The other questions showed weaker tendencies for one common opinion (see Figure 3).

## 4.2 Opinion Change Behavior

The second round of the experiment, where the topics were shown with additional user comments, revealed interesting insights into the influence of majorities on the personal opinion.

We could show, that for all of the topics some participants tended to change their opinion because of a majority of comments with contradictory opinions. The highest amount of opinion change could be detected for the topics of usage fees for public toilets and the taxation of unhealthy food, whereas regarding the obligation of smoke detectors installation the fewest participants changed their opinion (see Figure 3).

Falling back on paired-samples t-tests for comparing the initial opinion with the opinion influenced by the majorities shows, that the overall acceptance for usage fees for public toilets increases from initial ( $M = 1.6$ ,  $SD = 0.49$ ) to influenced opinion ( $M = 1.9$ ,  $SD = 0.34$ ,  $t(162) = -5.1$ ,  $p < .001$ ). In contrast, the opinion for taxation differences depending on food healthiness of food decreased significantly from the initial measure above mean acceptance ( $M = 1.6$ ,  $SD = 0.48$ ) to less acceptance ( $M = 1.5$ ,  $SD = 0.50$ ) after being confronted with the majority of contradictory opinions ( $t(162) = 3.0$ ,  $p < .01$ ). The opinion distribution regarding the topics Ronaldo and obligation of smoke detectors did not change significantly.

The direction of opinion change differed depending on the particular topic and could not be generalized. For the topics 1 and 3 the majority of the opinion changers switched from disagreeing to agreeing. For topics 2 and 4 it was the other way around (see Figure 4).

Summarizing, only 14 % of the participants did not change their opinion on any topic. A total of 72 % are switching one or two times to the opinion majority and 13 % withdraw their own opinion three or more times.

## 4.3 Influences on opinion change

We investigated the influence of age, gender, personality traits, and social media expertise as possible factors influencing the strength of the bandwagon effect.

Age and social media expertise did not show a relation with joining the opinion majority in our sample. Gender affected the opinion change for the topic of usage fees for public toilets. Concerning the public toilets, men changed their opinion significantly more often than women ( $t(161) = 2.2$ ,  $p < .05$ ).

The Big Five personality traits neuroticism, extraversion, and openness did not reveal arguable links to our research subject.



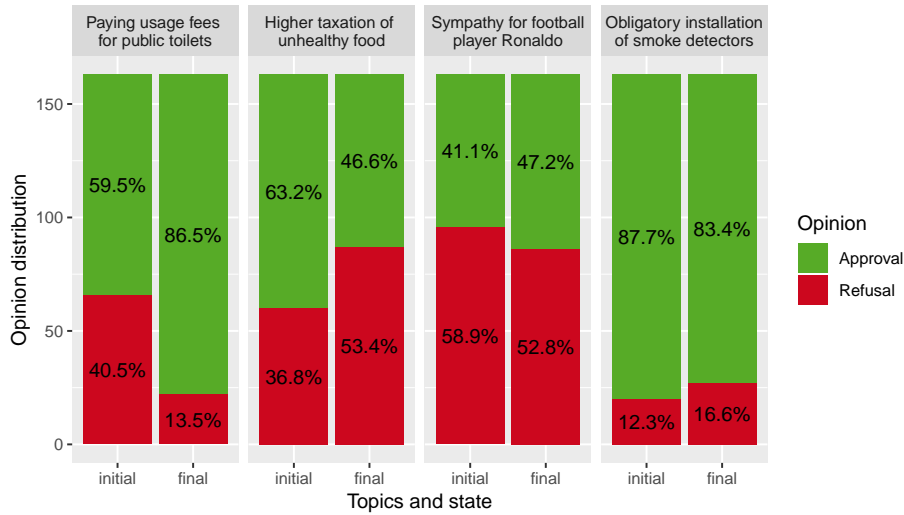


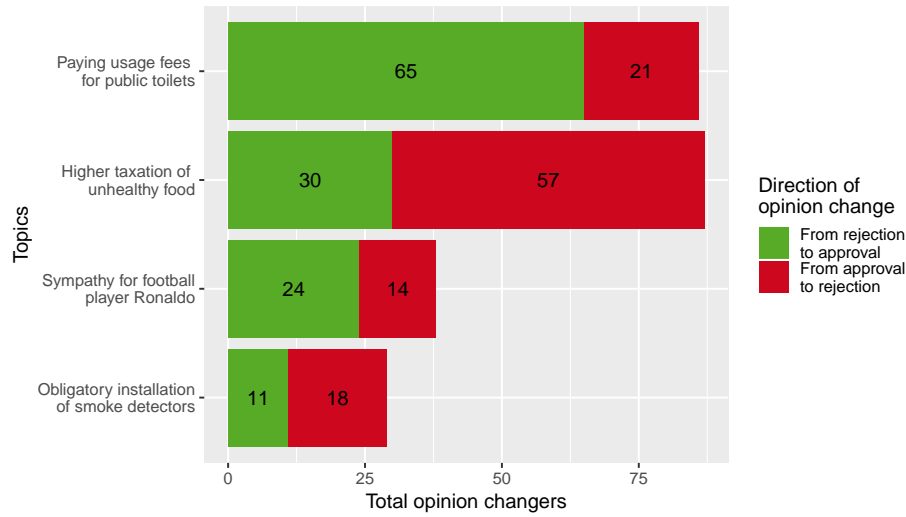
Fig. 3. Initial and final opinion distributions regarding the presented topics ( $N = 163$ )

## 5 Discussion

In our research, we focused our design on concrete conditions and wanted to explore influence factors on the user's opinion through opinion majorities. The taken approach aimed at implementing the theoretical concepts of the spiral of silence and facilitating the bandwagon effect for manipulating the user's decision making on various topics. Through presenting a majority of opposing comments after asking for an initial opinion, we could lead 86 % of the participants to rethink their opinion and join the majority for at least one of the topics.

The chosen topics varied in terms of importance and prior opinion accordance. While almost 90 % agreed to the obligation for installing smoke detectors, only about 40 % indicated sympathy for the football player Ronaldo. This shows, that our topics covered diverse importance and relevance for our sample. While those two topics reached only marginal and not significant changes of opinion distribution, the other two topics concerning usage fees for public toilets and additional taxation of unhealthy food, obtained significant changes in opinion distribution through showing a majority of contradictory opinions. This could be a sign for differing decisiveness regarding the given topics. The direction of opinion change does not allow further assumptions for potential topic-related cues of opinion change. We should further question, which topics are suitable for examining the spiral of silence and the bandwagon effect, because it is almost inevitable to involuntarily call further cues related to the individual with certain topics.

Further studies could tackle also the conviction of the user by including supportive majorities for preventing false-positives from users who were undecided



**Fig. 4.** Direction of opinion change

for a certain topic or just forgot their initial choice. Lee et al. found for supporting majorities, that the users tend to increase their rejection for a topic when they initially held a negative opinion. In contrast, supportive positive majorities showed no further polarizing effect [9].

As our study was designed to keep the answering effort low, we did not consider different semantics in our comments like Waddel et al. did in their experiment [24]. They found that the perception of user comments through their content can differ in authenticity.

Contrary to our findings and the aforementioned research, Porten-Che e and Eilders doubt the transferability of the spiral of silence theory to user-generated content at social networking sites, as they did not find any relationship between the exposure of user-generated content with majorities of equal or contrasting opinion and the users' participation on these discussions [17], which demands for further consideration of our research topic.

### 5.1 Necessity of gaining a digital maturity

Our study shows, that users of social network sites seem to be influencable through the presence of illusory opinion majorities in user comments. This finding calls for a need of action as social networking sites gain popularity in spreading political information and can hereby attain increased influence on democratic processes [28]. Moreover, a meta-analysis of studies dealing with the impact of social media use on offline political participation shows, that political engagement increases slightly with more frequent social media use, though not uncovering the underlying causal effects [1].

An appropriate way to deal with this issue would be to enhance the user's assessment of user-generated content on social networking sites so that they are more aware of the pitfalls in perceiving opinion distributions online [14]. For doing so, further research on this topic has to be conducted, overcoming some of the limitations which occurred in our study. It is important to involve more participants and also include older and less social media experienced users to get a better look on the overall picture. A more precise questioning of the users' opinion and conviction regarding the examined topics could also lead to a better understanding of the underlying reasons for the change of their initial opinion.

We can conclude that our study contributed through pointing out further directions and suitable strategies to reveal the peculiarities of opinion formation in online social networks.

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