

---

# Analyzing Viewpoint Diversity in Twitter

**Engin Bozdag**

Delft University of Technology  
Faculty Technology, Policy  
Management  
Values and Technology  
Department  
v.e.bozdag@tudelft.nl

**Qi Gao**

Delft University of Technology  
Faculty EEMCS  
Web Information Systems  
Group  
q.gao@tudelft.nl

**Martijn Warnier**

Delft University of Technology  
Faculty Technology, Policy  
Management  
Section Systems Engineering  
M.E.Warnier@tudelft.nl

**Geert-Jan Houben**

Delft University of Technology  
Faculty EEMCS  
Web Information Systems  
Group  
g.j.p.m.houben@tudelft.nl

**Abstract**

Information diversity has a long tradition in human history. Recently there have been claims that diversity is diminishing in information available in social networks. On the other hand, some studies suggest that diversity is actually quite high in social networks such as Twitter. However these studies only focus on the concept of source diversity and they only focus on American users. In this paper we analyze different dimensions of diversity. We also provide an experimental design in which an empirical study can be performed to compare different concepts of diversity for Twitter users from different countries.

**Introduction**

Social Information streams, status updates from social networking sites have emerged as a popular means of information awareness. Political discussions on these platforms are becoming an increasingly relevant source of political information, often used as a source of quotes for media outlets [5]. While most original reporting comes from traditional journalists, social publishing makes it increasingly possible to tap into breaking news. As some claim, "news no longer breaks, it tweets" [1].

It is often argued that the Internet, by promoting equal access to diverging preferences and opinions in society, actually increases information diversity. Twitter allows fascinating information access, but also at the same time

leads to information overload. In order to deal with information overload, a Twitter user will either have to decrease the number of incoming information (e.g. by limiting the number of people he follows) or by using a news recommendation algorithm that finds the most relevant information for the user. However, providing people with only agreeable news items may have negative social consequences [10]. Group deliberation among like-minded people can create polarization; individuals may lead each other in the direction of error and falsehood, simply because of the limited argument pool and the operation of social influences. Increased polarization makes it more difficult for society to find common ground on important issues [13]. Research shows that 'confirmation bias' occurs when like-minded individuals form a group in order to make a decision [12]. When participants receive new information in a decision case after they have reached a preliminary conclusion, a clear preference was demonstrated for information supporting the preliminary group decision.

The question is, whether users are exposed to different, challenging viewpoints in social media such as Twitter. An et al. [1] have investigated source diversity for major news sources and observed that there is a high level of (indirect) source diversity for American Twitter users. However, as we will show, diversity entails more than just source diversity. Are users mainly exposed to news from major news sources, or does the minority get a chance to reach a wider audience as well? Can we observe the same pattern in different countries, for instance, in the European political landscape?

In order to find answers to these questions, we have created an experimental design to study diversity in Twitter. In this paper, we first perform a conceptual

analysis of the value information diversity using theories from media studies and information law and policy. Later, based upon this theory, we present our research questions. Then, we show our experimental design and challenges we face in order to perform such an empirical study.

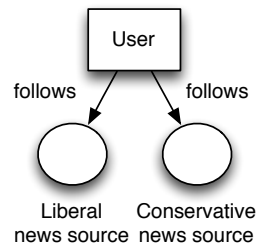
### **Value Sensitive Design**

Value Sensitive Design (VSD) is an approach that aims to integrate values of ethical importance in a principled and comprehensive manner into the design of information technology [3]. It assumes that human values, norms, moral considerations can be imparted to things we make and use. VSD employs an integrative and iterative tripartite methodology, consisting of conceptual, empirical, and technical investigations. The conceptual investigation aims to create a working definition of the value. Conceptual analyses need to be informed by empirical investigations of the human context in which the technical artifact is situated. Technical investigations involve the proactive design of systems to support values identified in the conceptual investigation.

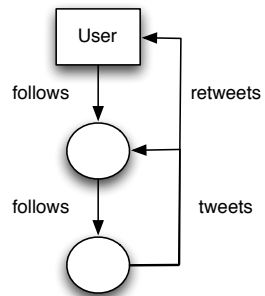
In this paper we apply Value Sensitive Design the following way: First, as a conceptual analysis, we analyze the value diversity using theories from philosophy and media studies. Second, as an empirical study, we formulate research questions and provide an experimental design which we will use to carry out an empirical research. To understand how a value plays out in different cultures, we study and compare different cultures. Finally, we discuss how the empirical research and the conceptual analysis can have implications for the technical design.

### **Conceptualizing Diversity**

In media studies, diversity forms the basis for the popular 'marketplace of ideas' concept, in which different ideas and opinions are free to compete for the attention of



**Figure 1:** Own exposure



**Figure 2:** Indirect exposure

users. Exposure to different ideas leads to informed decision-making, cultural pluralism, citizen welfare and a well-functioning deliberative democracy [11]. *Free Press theory*, a theory of media diversity, states that we establish and preserve conditions that provide many alternative voices, regardless of intrinsic merit or truth, find a hearing, provided that they emerge from those whom society is supposed to benefit its individual members and constituent groups [15].

There is an assumption that a greater diversity in sources will lead to a greater diversity of content. However, there is no empirical evidence supporting the existence of such a relationship [11]. It has also been argued that to fulfill the objectives of the marketplace of ideas metaphor, policymakers need to focus on exposure diversity. So, one should not look at availability of different sources or content, but whether the public consumes them diversely [11].

The media can also improve diversity by providing "open access" [9]. It can distribute its attention perfectly equal to all identifiable preferences, streams, or groups, or positions in society. The media thus provides perfectly equal access to their channels for all people and all ideas in society, minority groups and other demographic groups are portrayed on television in reasonable proportion to their prevalence in society. Karpinen also argues for open access diversity: "the key task for media policy from the radical pluralist perspective is to support and enlarge the opportunities for structurally underprivileged actors and to create space for the critical voices and social perspectives excluded from the systematic structures of the market or state bureaucracy" [6]. Thus, if people are exposed to media outlets that are not necessarily diverse in themselves, but are traditionally underrepresented in

people's media diet, this would increase diversity [4].

## Research Questions

1. **User's own exposure to diversity and multiple sources:** Do users expose themselves to sources with different opinions in Twitter?
2. **Indirect exposure:** Are users exposed to diverse information indirectly in Twitter?
3. **Open-access diversity** Are users only receiving information from major news sources? Or are they also exposed (directly or indirectly) to minority viewpoints?
4. **User's political bias:** Do users post political messages whose political position more or less reflects the political position of those messages that the users receive?

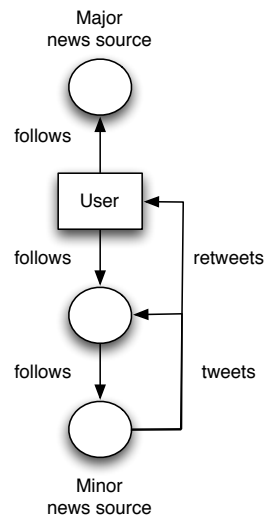
## Experimental Design and Challenges

### Data Collection

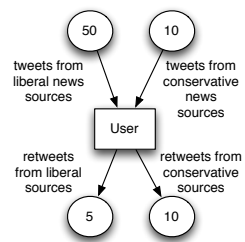
Over a period of more than one month we crawled microblogging data via the Twitter streaming API. We started from a seed set of Twitter users  $U_s$ , who mainly publish news-related tweets. The seed users were manually selected to cover different types of users including mainstream news media, journalists, individual bloggers and politicians. By monitoring the Twitter streams of  $U_s$ , we were able to add another set of users  $U_n$ , who actively interacted with users in  $U_s$ , to the crawler. To investigate the impact of cultural differences on the concepts of diversity for Twitter users, we repeated this data collection method for several countries such as US, the Netherlands and Turkey.

### Mapping Political Leaning of the Sources

We mapped the political leaning of Dutch seed users into five groups, left, centre-left, centre, centre-right and right. We did this using a number of public data [7, 16, 14].



**Figure 3:** Exposure to minority views



**Figure 4:** User's political bias

The political parties' stance in the landscape is determined by [8]. We will apply similar classification to the seed users from other countries. For example, to map the Turkish media sources, we will use the work by Baris [2].

*How do we translate Research Questions into Metrics?*

**Own exposure:** For each user in our user sample we compare the number of her followees from different groups of which the political leanings have been categorized as discussed above (See Fig. 1)

**Indirect exposure:** We explore for each user all the retweets published by her followees and investigate if the user receive more diverse information through indirect media exposure (See Fig. 2).

**Open-access diversity:** For each user we look into her followee list to investigate if the user is mainly exposed to major news sources (See Fig. 3)

**Users' political bias:** For each user in our sample we investigate whether the political position of the messages retweeted by a user is significantly skewed from the political position of the messages that she receives (See Fig. 4).

## Conclusion and Future Work

As we have shown, value diversity is more than just source diversity. The theory shows us that, in order to achieve diversity, the audience should be exposed to all voices, including those of the minority. We aim to investigate whether open-access diversity exists in Twitter and whether exposure, open-access and source diversity differ per country. This empirical study will complement our conceptual analysis. As a last step of VSD methodology and future work, we aim to investigate how diversity can be included in design.

## References

- [1] An, J., Cha, M., Gummadi, K., and Crowcroft, J. Media Landscape in Twitter: A World of New Conventions and

Political Diversity. *Fifth International AAAI Conference on Weblogs and Social Media* (May 2011), 18–25.

- [2] Baris, R. *The Turkish Media Landscape*. Intellect Books, 2007, 289–301.
- [3] Friedman, B., and Kahn, P. H. Value Sensitive Design : Theory and Methods. *Engineering*, December (2002).
- [4] Helberger, N. Diversity by Design *Journal of Information Policy*, 1 (2011)
- [5] Jürgens, P., Jungherr, A., and Schoen, H. Small worlds with a difference: New gatekeepers and the filtering of political information on Twitter. *ACM WebSci'11* (2011)
- [6] Karppinen, K. Rethinking media pluralism and communicative abundance. *Observatorio (OBS\*)* 3, 4 (2010).
- [7] Krouwel, A. Zo links zijn de kranten niet. Tech. rep., Dag, 2008.
- [8] Krouwel, A. Regeerakkoord analyse Kieskompas 2012, 2012.
- [9] McQuail, D., and Van Cuilenburg, J. J. Diversity as a Media Policy Goal: a Strategy for Evaluative Research and a Netherlands Case Study. *International Communication Gazette* 31, 3 (Jan. 1983), 145–162.
- [10] Munson, S. A., and Resnick, P. Presenting diverse political opinions: how and how much. CHI '10, ACM (New York, NY, USA, 2010), 1457–1466.
- [11] Napoli, P. Deconstructing the diversity principle. *Journal of Communication* 49, 4 (1999), 7–34.
- [12] Schulz-Hardt, S., Frey, D., Lüthgens, C., and Moscovici, S. Biased information search in group decision making. *J. of Personality and Soc. Psychology* 78, 4 (2000).
- [13] Sunstein, C. The Law of Group Polarization. Tech. rep., Dec. 1999.
- [14] Trendlight. AD is de krant voor Henk en Ingrid, 2012.
- [15] van Cuilenburg, J., and McQuail, D. Media Policy Paradigm Shifts: Towards a New Communications Policy Paradigm. *European J. of Communication* 18, 2 2003.
- [16] van der Eijk, C. The Netherlands: Media and Politics between Segmented Pluralism and Market Forces. Cambridge University Press, Aug. 2000, 510.