Recommender System:

Group Assignment 

*Hans Alberto Franke,* [*h.a.franke@students.uu.nl*](mailto:h.a.franke@students.uu.nl)

*Lena,* [*h.a.franke@students.uu.nl*](mailto:h.a.franke@students.uu.nl)

*Gianis,* [*h.a.franke@students.uu.nl*](mailto:h.a.franke@students.uu.nl)

Personalization for Public Media

Applied Data Science - Utrecht University - 2021

**Main Objective**

Currently, many PSM VOD services have a functioning recommender system but are limited in scope by giving recommendations based on content-based filtering. But how can values such as pluriformity and diversity be incorporated into an algorithm? How would you translate these values into audience metrics? Which data is needed? Which implicit and explicit feedback mechanism are needed? How would the user interact with the recommender system? For the final assignment you will develop a recommender system for a public broadcaster.

# Introduction

Article: Public Service Media, Diversity and Algorithmic

Recommendation

Public Service Media (PSM) websites are an interesting case for the implementation of recommender systems for media personalization, as the PSM organizations need to balance the optimization of exposure with traditional but ill-defined PSM policy goals such as fairness, viewpoint diversity and transparency. Furthermore, the mathematical logic of recommender system needs to be adapted to the legacy broadcasting scheduling and publishing strategies and procedures.

Finally, as the PSM organizations step into new territories, domestication and adaption of the recommender system technologies must take place while PSM organizations try to embrace the new knowledge and new professions associated with recommender systems. Based on 25 in-depth interviews conducted from December 2016 to April 2019, this paper presents a cross-European analysis of the implementation of recommender systems in nine European public service media organizations from eight countries. The findings indicate that PSM organizations, although viewing personalization as competitive necessity, approach recommendation systems with hesitation in order to maintain core PSM-values in the online environment. Furthermore, although the collaborative filtering chosen by the PSM organizations indicate a user centered approach, curation systems on top of recommender systems re-install a broadcaster-centric approach.

Another Article

Information diversity has a long tradition in human history. Recently there have been claims that diversity is diminishing in information available in social networks.

In order to deal with information overload, a **media** user will either have to decrease the number of incoming information (e.g. by limiting the number of news he follows/receive) 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.

In order to find answers to these questions, we have created an experimental design to study diversity in Mind Dataset. In this paper, we first perform a **conceptual analysis** of the value information diversity using theories from media studies and information law and policy. Following by **empirical investigation** with interviews of the stakeholders of this environment and mapping their values. Later, based upon this theory, we present our research questions, and how to apply **diversity** in **the technical design** (interface and recommender). Then, we show our experimental design and challenges we face in order to perform such an empirical study.

[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.

[12] Schulz-Hardt, S., Frey, D., Luthgens, 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.

# Literature Review

* Algorithms?
* Metrics?
* • **Conceptual investigations** aim at (theoretical) conceptualizing the various values and value tensions
* • **Empirical investigations** aim at understanding the users’ attitudes, desires, opinions, and values.
* • **Technical investigations** concern identifying value issues based on existing technical designs and translating these values into technical features.

Recommender systems have been build to serve individual interests by selecting and filtering content, while public service broadcasting traditionally have aimed to reach the whole population with content that editors think is beneficial for citizens. The intention is to mediate a public sphere. Bringing the two entities sounds as a contradiction in terms.

When content exposure is personalized via a recommender system, the question emerges: To which extend will the algorithm and the editors / data curators recommend content that reflects individual user interests if these do not align with the content obligations? The question is relevant for more than the user experience. The funding and political legitimacy of public service media is closely connected with the content obligations. If this content is not being exposed to users, the legitimacy of the institution may be endangered. Conversely, the programming and scheduling strategy of the PSB and PSM organizations have always been to offer popular content, such as music, sports and entertainment to listeners, viewers and users. How will PSM organizations approach this balancing?

**Public service media** is often linked to a set of ideals—the PSM remit [27]. UNESCO [43] lists as principles for public service broadcasting:

∙ Universality

∙ Diversity

∙ Independence

∙ Distinctiveness

In media politics, the diversity of media content providers,

ownership and media outlets is a measure of a well-functioning

democracy [17, 29]. In the area of news and media, a specific

concern has grown that algorithmic recommender systems

will lead to a loss of exposure diversity [29]. Subsequently,

much discussion has revolved around filter bubbles [32] caused

by collaborative filtering [5, 14, 30]. Suggestions for regulating

exposure diversity have been proposed by [6, 7, 16, 17]

but also criticized [39]. Recently, measurements in a news

context have however showed that algorithms are as good at

providing diversity as human editors [28] and that the problem

of filter bubbles may be overestimated [47]. Fletcher [13]

finds that news repertoires of users who find news via search

engines have a more diverse and balanced news consumption,

while [12] reaches a more mixed conclusion. However, diversity

exposure concerns are still associated with algorithmic

recommender systems [10, 15].

## What is Diversity?

Will PSM organizations stick to the broadcaster-centric

approach that prioritizes certain content or will they embrace

the customer-choice logic of personalization? **A key to this**

**question is how diversity is created in the recommendations:** Is

it defined by an editor defined to reflects different viewpoints

(source diversity) [29], or is calculated to reflect the global

diversity of items available for recommendation, the diversity

within the recommended items (intra-list diversity) [8], or

does it take the point of departure in the users’ profile [46]?

Due to the special content obligations, diversity is a sensitive

topic in public service media.

While diversity in itself is a problematic concept [22],

achieving diversity in algorithmic recommendations is a problem

with importance for user experience and cross-selling of

products [8, 24]. Sorensen and Schmidt [39] indicates that

there might exist a gap between how diversity is understood

and treated as a mathematical concept in recommender systems

[8], and how media policy and editors construct the

concept [29]. Where the former seldom takes the semantic

context in consideration, the core parameter in the latter is

contextually and socially defined view-point diversity [1].

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 users. Exposure to di\_erent 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,

\_nd a hearing, provided that they emerge from those

whom society is supposed to bene\_t 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 ful\_ll the

objectives of the marketplace of ideas metaphor,

policymakers need to focus on exposure diversity. So, one

should not look at availability of di\_erent 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 identi\_able 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. Karppinen 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].

## VSD: Triparte Methodology

Friedman defined a list of values as she called “Ignition list” see table 1. Kheirandish, see figure 2, continued these definitions in a framework that makes it easy for a team to discuss about many different stakeholders, values and tensions by using cards that are put on “plot” to have a full picture of the product and the values discussed. The heterogeneity of the team is a important part of the project to avoid mentioned bias. People with many different backgrounds have better variety of insights and discussion on how to make the system taken into account as many different human values as possible.

Stakeholders are an important aspect of the VSD as they can be direct (p.e customers) or indirect (p.e society), human or non-human (p.e technology / computer / app). The steps to define stakeholders are: 1) visualize all stakeholders, 2) categorize into group/clusters (if needed) and 3) list key characteristics.

## Conceptual Investigation: Stakeholders and values

**Stakeholders in a media environment: [1] => Conceptual Investigations**

* 1. Newsmakers

Suppliers of raw materials do get paid for their supplies. The steelmaker pays the iron ore supplier. Even if he gets it on credit, he is merely postponing payment, but he must pay. Unfortunately, the newsmaker supplies the raw materials the journalists need for their news mill but he never gets paid. Besides that, when issues that border on the journalist crop up, especially with her social responsibilities, the newsmaker is hardly regarded as a stakeholder, let alone a business partner.

* 1. Media Users

Since advertising is the lifeblood of the media, which translates as wages for the journalist, profit for the media owner and consumers’ access to media contents, it is in place to carry advertising along wherever the media go, especially when the issue at stake is the establishment of an institutional framework

* 1. Media Scholars
  2. Jornalist?

The circumstances in which contemporary journalists find themselves are proof that forces outside their territory determine the survival and sustenance of their job. For instance, to get “raw materials” which they run through the mill and process as news, they rely solely on the newsmakers. If, after packaging the information and the news content consumers refuse to buy, read, watch, listen or browse, their work becomes inconsequential and illegitimate because the availability of an audience legitimizes a journalist and his profession. If media scholars who teach journalists their work refuse to impart knowledge, journalists become stagnant and start smelling.

Moreover, journalists also rely and depend heavily on commercials from advertising agencies and public relations officers who daily receive requests from the management of news producers for a share of their ad spend. Whenever the journalist’s interests need to be protected or furthered, he turns to his association or some non-government organizations whose job is to do that. Most journalists are employees of media owners who are not into journalism but for business. Crafters of media policies that only take cognizance of government, the journalist and his audience will have to do a rethink and do the right thing by coming up with an all-embracing system that works on an all-inclusive principle.

The values that drive journalists’ performance will be those that are commonly

held by their audiences (Sorauf, 1957, p. 619). They are universally shared

private interests (Benditt, 1973, p. 293), held by a large number of people scattered

across the world. However, the search for a global ethics has to tackle the dilemma the journalist is most likely to face when the public interest does not reflect the majority view, but, rather, represents a superior interest

* 1. Media Owners
  2. Government
  3. Society

The concept of public interest in this case is multidimensional and highly variegated. For a journalist, public interest assumes the majoritarian perspective, which means her ability to appeal to the values and attitudes that are commonly shared by the multifarious segments of her audience. Therefore, journalists’ ability to satisfy the majority of her audience is a determinant of the survival and sustenance of democracy, since she is dealing with the “sum of individual interests” that is paramount (McQuail, 1992, p. 22). In this case, some minor interests may not be covered but as long as the journalist’s practice is in tune with the general will, she is believed to be working in the public interest. Public interest here, according to Jean-Jacques Rousseau, is “if the general will wills it” (cited in Benditt, 1973. p. 293).

The rationality that characterizes such policies is one-sided because the criteria for evaluating options and making decisions among them are not universal but based on the knowledge of a privileged few. A concrete model of public policy should incorporate not simply the journalist, but also the strategic behavior of the various interest groups (Rausser & Foster, 1990, p. 642).

# VSD

* Stakeholders
* Interviews => Define values matrix
* Values => chose one (diversity on pluriformity)

# Recommender System and User’s Interface

* Types?
* Values?
* Metrics?
* Interface ? Support design.

Examples:

<https://peach.ebu.io/technical/tutorials/algorithms/diversified/>

https://peach.ebu.io/technical/jupyter\_platform/

Most PSM organisations implement content-based filtering (C-B) and collaborative filtering (CF). A number of PSM organisation also report to use a diversity module for recommendations. Finally, some PSM organisations use the recommender system as part of a curation system, controlled by editors and scheduling staff via business rules.

Metrics v1:

**∙ Diversity, Exposure and PSM Obligations**

The improvement of user loyalty and content exposure, particular of long-tail content and under-performing content, is a main motive for implementing recommender systems. The exposure of the less used content is part of the PSM obligation of promoting diversity.

Metrics v2:

How do we translate Research Questions into Metrics?

* **Own exposure**: For each user in our user sample we compare the number of her followers 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 signi\_cantly skewed from the political position of the messages that she receives (See Fig. 4).

* **MY Suggestions:**
  + Different categories?
  + % of pollical news from “left or right” ?
  + How many different news broker user has accessed last month: fox, cnn, ??

# Conclusion

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.

However, a more profound reason for the hesitation could be suggested, based in a paradox: The public service mission is - as stated - to enlighten, inform and educate. The role of entertainment has either been the sugar-coating on the pill of information, part of the provision of diversity or the justification of the license fee. Based on the apparent rationality of the enlightenment, information and education that PSM organizations are based on, PSM should warmly embrace recommender systems. These systems should be perfectly rational tools for efficient dissemination of knowledge.

The absence of clear definitions of diversity and of the relation between the personal and the societal could point to the latter. Not defining or operationalizing these concepts can however ironically be a strategically fortunate position for PSM organizations.

# Bibliography

|  |  |
| --- | --- |
| [1] | T. Asikis, J. Klinglmayr, D. Helbing and E. Pournaras, "How value-sensitive desing can empower sustainable consumption," no. https://doi.org/10.1098/rsos.201418, 2021. |
| [2] | R. Burke, "Evaluating the dynamic properties of recommendation algorithms.," *In Proceedings of fourth ACM conference on recommender systems,* no. doi: 10.1145/1864708.1864753, 2010. |
| [3] | R. Hu and P. Pu, "Helping users perceive recommendation diversity.," *In Proceedings of the workshop on novelty and diversity in recommender systems, divers.,* 2011. |
| [4] | "Pattern Library," no. https://aapatternlibrary.wordpress.com/. |
| [5] | D. P. ,. V. Chen He, "Interactive recommender systems: A survey of the state of the art and future research challenges and opportunities," 2016. |
| [6] | Z. Fayyaz, M. Ebrahimian, D. Nawara, A. Ibrahim and R. Kashef, "Recommendation Systems: Algorithms, Challenges, Metrics, and Business Opportunities," 2020. |
| [7] | H. Cramer, J. G. Gathright, A. Springer and S. Reddy, "Assessing and addressing algorithmic bias in practice," *https://doi.org/10.1145/3278156,* 2018. |
| [8] | J. Davis and L. Nathan, Value Sensitive Design: Applications, Adaptations, and Critiques, 2015. |
| [9] | R. Dobbe , S. Dean, T. Gilbert and N. Kohli, "A Broader View on Bias in Automated Decision-Making: Reflecting on Epistemology and Dynamics," no. https://doi.org/10.14763/2020.4.1534, 2018. |
| [10] | B. Friedman, Human Values and the Design of Computer Technology, Cambridge University Press, 1997. |
| [11] | S. Kheirandish, M. Funk, S. Wensveen, M. Verkerk and M. Rauterberg, "HuValue: a tool to support design students in considering human values in their design," *International Journal of Technology and Design Education,* no. https://doi.org/10.1007/s10798-019-09527-3, p. 30:101, 2020. |
| [12] | J. Simon, P.-H. Wong and G. Rieder, "Algorithmic bias and the Value Sensitive Design approach," 2020. |
| [13] | StakeholderMap, "https://www.stakeholdermap.com/retail-stakeholders.html". |
| [14] | R. Burke, "Hybrid recommender systems: Survey and experiments. User Modeling and User Adapted Interaction," 2002. |
| [15] | M. J. Pazzani and D. Billsus, "Content-based recommendation systems," no. http://www.springerlink.com/index/qq35wt68l6774261, 2007. |
| [16] | S. Ternier, K. Verbert, G. Parra, B. Vandeputte, J. Klerkx, E. Duval and X. Ochoa, "The ariadne infrastructure for managing and storing metadata.," *IEEE Internet Computing, 13 ,* no. doi: 10.1109/MIC.2009.90, p. 18–25, 2009. |