Diversifying for Democracy: On the Framing of Diversity in the NRS Design and the Normative Consequences for Journalism

Jannie Møller Hartley[1,*,†] and Elisabetta Petrucci[1,†]

[1] *Roskilde University, Universitetsvej 1, 4000 Roskilde, Denmark*

Abstract

The concept and umbrella term news diversity has been introduced in the literature in Social Sciences and Computer Sciences as a way to counter these phenomena and to produce well-functioning news recommender systems appropriate for a democratic society. The aim of this article is to critically analyse what kind of normative assumptions about the role of journalism emerge from the framing of diversity in the literature on news recommender systems. We do so by conducting a framing analysis of the concept of diversity in the literature in the fields of Social Sciences and Computer Science (*N*=57). We show that diversity is framed as an essential component of a well-functioning NRS, as it is framed as the solution to the filter bubble and potential polarization problem. However, diversity is most often operationalized as diversity of news topics and political viewpoints on a left/right wing scale across the literature. Further the analysis shows how the cause of diversity´s importance changed over time in the literature from initially being rooted in the individual users' lives, connected to their potential boredom and information overload, to the more recent literature framing diversity in NRS as connected to the democratic role of news. The implicit role of democracy is linked to liberal models in the operationalization of diversity, while more deliberate and participatory models of democracy are less prominent.

Keywords

Diversity, Recsys, News, Framing Analysis, Literature Review, Democracy

1. Introduction

Since the early days of Journalism, it has been the task of journalists to choose between a number of given possible news item of the day and turn them into stories informing the public. This selection and gatekeeping process has been highly linked to normative ideals of the role of the press [49], which has historically also changed from an omnibus press system to a more segmented press, at least in a Western context [55].

With the digital turn in the field of journalism, users are not only segmented, but constructed as aggregated datapoints with AI-driven recommender systems [39], increasingly influencing how and what news gets produced and distributed to the public, leading to questions of how this role of journalism as cultivators of democratic publics can be safeguarded.

In the newsroom today decisions are increasingly made on the basis of large amounts of auto-generated big data of audiences [3, 11, 42], and it is these data that are now also being utilized in personalization projects [8] and for implementing and evaluating recommender systems. A report shows that personalization of recommender system is a common area for use of AI in newsrooms [47]. This trend marks a shift from journalism's traditional focus and orientation toward shared

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importance and the public sphere [18, 38, 39] to emphasising highly individualized news experiences where the news distribution is responsive and based on algorithmic surveillance and the interpretation of individuals' past behaviours [10].

Both in the academic and public debate there seems to be no doubt that this development will affect the democratic role and contribution of the press, however, it is still unclear and debated how [19, 27, 29]. On the more optimistic side of the debate, scholars have been advocates for the potential positive effects of increasing the general engagement with news, for news to become more responsive to audiences, to counteract negative effects of information overload and for personalisation to offer new business models that can ensure the survival of an otherwise challenged news industry [2, 27]. Critics have expressed concerns of increased audience fragmentation and polarisation creating echo-chambers or filter bubbles, in which audiences are exposed to content they are likely to agree with and that strengthens pre-existing beliefs, risking the loss of a shared public sphere [12, 19, 43, 50].

The concept and umbrella term news diversity has been introduced in the literature in Social Sciences and Computer Sciences as a way to counter these phenomena and to produce well-functioning news recommender systems appropriate for a democratic society. We take as starting point Helberger´s [27] claim that the design and evaluation of recommender systems can be done according to the perceived and aspired role of Journalism, but given that Journalism historically has many different roles and functions in democratic societies according to Strömbäck [49], it remains important to investigate which role and function of journalism is taken as normative when recommender systems are designed and argued for in academic scholarship. This is important because this research feeds into the media industries, who currently design and implement NRSs across their sites and services. Furthermore, much of the existing literature focusing on recommender system design presents diversity as solution to the filter bubble issue by means of design, influencing the way problems in journalism are defined and which actors are designated to solve them, which remains imperative to examine. While previous literature has done a good job in mapping and discussing potential and shortcomings of algorithmic news recommendation in democratic society, it has done so without clearly explicating neither the normative role of journalism assumed to be desirable, nor the impact of algorithmic recommendation might have on such role.

Thus, the aim of this article is to contribute to this line of research into diversity in algorithmic news curation, but rather than looking for gaps and important avenues for future research into how algorithmic curation affects users or journalists in the newsroom, our aim is to critically analyse what kind of normative assumptions about the role of journalism emerge from the framing of diversity in the literature on news recommender systems. As this vast body of literature often feeds into the design and the implementation of news recommenders, it is important to investigate and discuss how such normative assumptions about journalism matter for this development and thus also for the future of news curation, as power is delegated to specific actors and specific ways of framing diversity in news are presented as the solution to the problems in the news industry.

We do so by conducting a framing analysis [17] of the concept of diversity in the literature in the fields of Social Sciences and Computer Science. Framing theory has proven valuable in pointing towards implicit ways of framing problems and solutions, which normatively privilege some perspectives while others are ignored or not perceived as possible avenues. Indeed, if the design and evaluation of news recommender systems says something about the implicit normative role of journalism, analysing the framing of the conceptualization and operationalization of diversity in news recommendation will allow us to gain a sense of the normative assumptions about the democratic role of journalism in the literature. In the next section we present and position our study in relation to previous studies on news recommenders in general and on diversity in particular. Following a section presenting the methods and the data we proceed with the results. Finally, we discuss our results in relation to the consequences of this framing for the future of recommender systems in the news industry.

2. State of the Art

NRSs are algorithmically driven personalization systems that make use of implicit user data to make assumptions about what news readers find interesting and relevant. It is the reliance on implicit user data, rather than on specific user choices that makes algorithmic personalization considerably different from customization [4]. In the literature both personalization efforts that deal with the domain of news more generally (such as news aggregators like Google News or the recommendation of news on social media) and personalization efforts by the news industry have been dealt with under the umbrella term of news recommendation. However, in this context, we use the term news recommender systems (NRSs) to indicate algorithmically driven distribution systems specifically employed by the news industry.

NRSs have become a way to sell news to audiences, but arrived in the news industry from the domain of social media, where they were originally meant to "sell ads to the audiences and audiences to advertisers" [8, 15]. In this sense, it is not surprising that their entrance in the domain of news was followed by concerns about issues of filter bubbles and polarization [43, 50]. These concerns have now lost traction in the literature, which recognizes the theory of filter bubbles as too naïve and simplistic [8, 40]; at the same time, more general concerns about the invisibility of the technological mediation influencing the users´ choice architecture, which is a de facto digital nudge, seem to remain relevant [31].

Helberger [27] worked specifically to construct a framework to evaluate the role of news recommender systems in democratic society and argued that, as a tool, they are neither good nor bad; it is the way they are used by the media organizations that makes them more or less beneficial to democracy, she argues. Similarly, Bodó et al. [9] calls for the relevance of choice of goals and consequent KPIs and for the need of framing such goals and KPIs according to the specific goals of news organizations, which are considerably different from the goals of platforms. The algorithmic recommendation of news not only has domain specific goals but presents also domain specific challenges, both technically and ethically. Technically, the algorithmic recommendation of news faces challenges connected to the time sensitivity of news content and the difficulty of modelling user profiles. Ethically, news personalization tends to work with and abide by different logics than the logics of journalism as a profession; for instance, Møller [40] describes how the reliance on audience metrics needed for algorithmic news recommendation is producing "an increasingly metrics-oriented mindset among reporters that comes into conflict with longstanding journalistic norms and ideals about journalists´ professional autonomy from market pressure". Being accurate is not enough – news recommender systems need to be able to fulfill not only their role as mediating technology, but their journalistic role as well. In this sense, the function of design has become key, and research has increasingly focused on the introduction of journalistic values in the design of news recommender systems [4, 27]. One of the values that seems to be key to the design (and evaluation) of news recommender systems, together with transparency and serendipity, is diversity, which is the focus of this article.

The term diversity is widely used in connection with media and news, most likely because the link between news media, diversity and democracy has been extensively researched and substantiated [33, 34, 41]. However, the term diversity not only can refer to different things, such as media ownership, sources, contents, and viewpoints, but can also be conceptualized in different ways. The fluid adoption of the term diversity has spilled in the interdisciplinary domain of recommender systems. Helberger et al. [28] has worked to try to systematize the way the term is used in relation to news recommendations. In her earlier work, she made a first distinction between diversity of supply, or the variety of content and sources media provide, and diversity of exposure, or the actual content audiences are exposed to, in order to argue that recommender systems may provide an opportunity for public service media to expose audiences to more diverse content, which they would usually not consume. For Helberger et al. [28], diversity of exposure is not a goal in itself, but a means to cultivate informed citizenship and therefore fulfill the democratic role of journalism.

News recommender systems, then, have a democratic role [27] and can and should be designed with such democratic role in mind.

Conducting a literature review of the concept of news diversity Joris et al. [32] found twenty-six different conceptualizations of the term in the studies they analyzed, which they argue are most frequently employed in the literature because relatively easy to measure, which is usually done in the context of "internal diversity" (p. 618), meaning on the single platform or site. In their literature review on media diversity Loecherbach et al. [36] also found a tight link between the conceptualizations and operationalizations of diversity; however, they claim that empirical operationalizations of diversity tend not to refer back to specific conceptualizations of the term. Moreover, while it is common to stress the relevance of diversity in connection to democracy, "further specifications as to the type of democracy that is used" are not given (p. 615).

Vrijenhoek et al. [55] analyze how practitioners at three different public service media organizations in the Netherlands conceptualize diversity within the scope of their recommender systems. They show that even within this limited domain, conceptualization of diversity greatly varies, and argue that it is unlikely that a standardized conceptualization will be achieved.

It is this line of research that our study is based within; however, since previous literature reviews [32, 36] found that diversity is rarely defined and clearly conceptualized, in our study we focus not on how its defined, but rather how diversity is operationalized and framed in the literature. Moreover, we intentionally employed only the keyword 'diversity' for our search, without attaching it to or supplementing the search with specific terms, such as 'source' or 'opinion' or 'viewpoint', in order to get a sense of what is the implicit framing of diversity in the literature. This tells us what normative role of journalism is implicitly guiding the studies, designs, and evaluations of such systems, which is important for the future role of such system for the news industries. Our study takes as starting point Helberger's connection between the normative role of journalism and the design of news recommender systems; however, rather than taking diversity by design as a given good for news organization, we seek to critically asses what implicit assumptions we find in the literature, investigating how the literature implicitly frames what sort of problem NRSs and diversity by design are seen as the solution to, as well as what sort of moral judgements and delegation of power to specific actors are happening along the way.

This leads us to asking, the following 3 research questions:

RQ1: How is diversity framed across Social Science and Computer Science literature on diversity in NRS?
RQ2: What does this framing tell us about the implicit normative role of journalism?
RQ3: What frames are left out and what might be the consequences for the design of NRS?

3. Methodology

The empirical material on which our analysis is based is a corpus of journal articles from the fields of Social Sciences and Computer Science. To construct such corpus of documents, we conducted two literature searches, using the same keywords - "diversity" AND "news" AND "recommender system" - in two different databases. The choice of keywords was guided by previous research, such as Loecherbach et al.'s systematic literature review of conceptualizations and operationalization of 'media diversity' in different fields [36]. While Loecherbach et al. used a variety of synonyms of diversity in their search string, we decided to only use the term 'diversity' because it "is more used in communication and computational science" [36] (p. 611), which are the fields we were primarily interested in. Moreover, such search would allow to capture both articles containing the critical perspectives on NRS and articles operationalizing diversity into data science models for testing and evaluations.

The search was conducted in the ACM Digital Library (Computer Science database) and Scopus covering the period 2011 to August 2024, where 65 results were found. Most of these results come

up in the period 2022-2024 showing a dramatic increase in research dealing with diversity (29 articles in this period vs 35 in the period from 2011 to 2022). After reading the abstracts eight articles from the Computer Science field were filtered out because they did not pertain to the domain of NRS. Thus, we ended up with a sample of 57 articles. We acknowledge that the reduced size of the corpus may be a limitation of our study; however, the study does not aim to conduct a systematic review of the issue of diversity in the domain of recommender systems, but rather to investigate how the issue of diversity has been framed in the literature and what such framing reveals about the perceived role of journalism.

Once the corpus of literature was gathered, the articles were imported in NVivo, in order to conduct inductive thematic coding, with the aim of identifying the framing of diversity both on a conceptual and operational level. After the coding process was completed, a framing analysis of the conceptualization and operationalization of diversity following Entman's approach was conducted [17]. We found framing analysis an ideal method to investigate the gap between conceptualization and operationalization of diversity, as "the conceptual definition of diversity and its normative underpinnings significantly affect how it is operationalized" [36] (p. 607). Entman [17] suggests that scholars conducting framing analysis should mine for four different properties of a frame: the proposal of a particular problem definition, interpretation, causal relation, moral evaluation and/or recommendation/proposed solution. This meant coding the articles for how they implicitly define the problem that diversity is supposed to solve, what are the causes of this problem, and how different moral evaluations take place as a part of this problem definition, paying attention to the delegation of power to specific actors and processes along the way as other divergent framings are left out.

4. Analysis

Our analysis shows that the Social Sciences literature includes articles written by scholars in the fields of Journalism, Media, and Communications Studies, as well as Information and Communication Law. This literature is published in journal article format, where literature review/state of the art sections tend to include accounts of diversity as a multidimensional concept. The following sections will analyze how diversity is framed in both the Social Sciences and Computer Science. We apply Entman's [17] conceptualization of frames as promoting a certain problem definition, cause, moral evaluation and solution.

5. Framing of Diversity in the Literature

Across the articles diversity is understood as an umbrella term, including different kinds of diversity, such as viewpoints, content, sources, and ownership, which usually tend to be defined or connected to specific academic definitions, such as the definition provided by [41]. In this definition diversity is seen as a multi-dimensional concept, including (a) source diversity, (b) content diversity, and (c) exposure diversity (p. 11). Boundaries between the different kinds of diversity tend to be blurred and differ within the literature; for instance, some authors include viewpoint diversity within content diversity, meaning that content diversity is achieved by providing a variety of content on a topic from different perspectives. While in the theoretical grounding of the literature ownership and source diversity are acknowledged, they tend to fade out in the practical logistics of the operationalization of news recommendations for concrete experiments.

Two overall framings of the problem of NRSs can be observed. The first one frames diversity as the solution to a problem of 'information overload'. One article illustrates this by describing how: 'Automated content recommendations are a common way to provide users of online media platforms a way of navigating the abundance of information' [7]. Another article states that: 'With this abundance of available content and the rapid pace of publishing, it becomes increasingly difficult for readers to filter out and distinguish what is relevant to them' [53]. The introduction of NRS in the news industry thus brought up a clash of modus operandi: while on the one hand recommender

systems are designed to give users more of what they want (according to accuracy measures), with the ultimate aim of avoiding information overload, on the other hand the role of journalism is to provide individuals with an overview of different kinds of news. This clash is exemplified by this article, which states that: "in a fragmented and rich information environment, algorithm-based recommendation systems help users find relevant content" [5]. Thus, the problem is framed as one of too much news for the user to navigate, and the proposed solution is NRS.

Secondly, the literature frames the problem as linked to problems of 'filter bubbles'. Many, if not all of the articles refer either directly or indirectly to the issue of filter bubbles, stemming from Pariser's book 'the filter bubble' from 2011. An indirect referring can be found in an article highlighting that: 'Systems have been criticized for introducing biases and being a potential threat to an informed citizenry and the democratic discourse' [5]. Another article highlights how: "During the development of news recommender systems, there is currently a large focus on the predictive power of an algorithm. However, this may unduly promote content similar to what a user has interacted with before and lock them in loops of "more of the same." [3].

The Computer Science literature rarely discusses the concept of diversity in itself; however, it is widely recognized to be an important aspect for a well-functioning NRS, and efforts are deployed to investigate how to better measure it and implement it. Just like in the Social Science literature there is no consensus about a definition of diversity, in the Computer Science literature there is no consensus about which metrics and formulas are more useful in measuring and implementing diversity. In general, diversity in this literature is understood as the opposite of similarity, and it is usually measured in terms of mathematical distance between topics or opinions. For example, a study argues that their 'findings can contribute to diversity-aware NRS's to nudge users toward the consumption of diverse topics and viewpoints [46]. Another example is an article, which 'propose a pre-filtering graph-based approach of extending the user profile to nudge him/her along a path toward unseen news topics.' [53]. The article further states that: 'Our algorithm's aim to improve the topical diversity concerning the content that an individual interacts with' [53]. Another article compared two groups of readers in a real-time experiment on the Danish site eb.dk and explains that: 'Drawing on the agenda-setting framework, we analyzed the coverage of political news, the salience of political issues and actors prevalent during the election, and the diversity in exposure to topics, actors, and issues between the two groups' [15]. What is important to note is that most of the literature deals with the issue of diversity within one single news site; therefore, the kinds of diversity most discussed in relation to how news recommender systems work are content and viewpoint diversity. Source diversity is mentioned in practical terms in connection with the workings of recommender systems on news aggregating sites, or sites that recommend news from (a variety) of different sources.

If, as Entman [17] explains, frames involve the managing of ´selection and salience´, the prominence of discussions about how to best achieve a sufficiently diverse list of recommendations, and how to balance accuracy and diversity measures signals that diversity is a prerequisite of a well-functioning NRS. Only later articles concern themselves with evaluating the way diversity is measured, what kind of diversity is implemented, which kinds of measures are employed and to what effect. The most recent literature also takes into account other normative values when designing NRS, such as the RADio framework introduced in [54], in which the authors develop values from normative democratic theory and evaluate the NRS mathematically according to these normative criteria, measuring for example alternative voices or the degree of fragmentation. But also, in these more recent articles diversity as a prerequisite for a well-functioning democracy is rarely discussed and most often assumed.

6. The Framing of the Normative Role of Journalism in the Literature

The normative role of journalism has traditionally been centered around its connection to democracy. In 2005, Strömbäck [49] called the relationship between journalism and democracy a 'social contract' (p. 332), necessary because "Democracy requires a system for the flow of

information, for public discussion and for a watchdog function independent of the state" (p. 332). He, then, proposed to leverage this connection to evaluate journalism´s work, by linking different models of democracy to different normative expectations for journalism. Overall, the literature analyzed in this article have divergent framings of the normative role of journalism.

While the framing of diversity as a solution seems to be quite stable in the Social Sciences literature, the framing of diversity in the Computer Science literature evolved throughout the years we have in our sample. The earlier literature (2011 until 2018) framed diversity as a necessary solution because recommender systems tend to recommend more of the same content and users get bored of receiving more of the same; recommender systems, then, needed to work to balance accuracy measures (giving users content similar to the one they already interacted with) with diversity measures. In this period, we see that the role of journalism is limited to not bore people, essentially building the NRS according to market-driven values of making a better product, by making users click on more news than they did before the NRS was implemented. The solution to the problem of boredom is finding out what people are interested in and recommending more of that content. An example is the article by Hsieh et al. [30] in which they "infer user's interest from their digital traces and create a user profile that has strong predictive power to the kinds of items that the user will be interested in. Abbar et al. [1] incorporate sentiments and entities in the comments and in the articles for the articles to achieve a more diverse recommendations.

Later articles, specifically the articles published after 2018, frame diversity as needed because recommending more of the same content to users impedes the democratic role of news; optimizing solely for clicks (or according to the content users have previously clicked) becomes not only boring for the user, but also dangerous for democracy, because aiding both the spread of sensationalist content and misinformation and the creation of filter bubbles. An article by Sonoda et al. [48] explains how filter bubbles, which only provide biased information to users, are generated due to excessive recommendations. There are several issues related to filter bubbles, including the biased nature of the information obtained and the tendency for society to become polarized and divided [48]. Similarly, Heitz et al. [26] argue that while little evidence of filter bubbles in online news environments is found, user's selective exposure and avoidance of opposing views could re-enforce particular political stances. Thus, we see increasingly that the framing of the problem changes with the introduction of Pariser's filter bubble hypothesis [43] into NRS research.

An article even labels this 'the normative turn in computer science, which scrutinizes the ethical and societal consequences of recommender systems' [23] This article is one of several focusing more on transparency and users' experiences of NRSs. In an experiment the researchers provided user control mechanisms and through focus groups and think aloud interviews with the users showed that reading history and flexible preference settings were valued by users [23].

Many of these articles are rooted in Helberger´s argument that diversity is not a goal in itself, but a means to the goal of citizens´ participation in democracy [28], and that recommender systems can be designed according to different democratic models [27]. This is especially visible in the articles conceptually exploring the possibility of nudging users towards more diverse consumption patterns. These articles celebrate the possibility recommender systems allow for and conceive it to be set in motion when users do not click on diverse enough content. An article for example tested different nudging mechanisms and concluded that these would enhance user's sensemaking of the algorithmic curation and the intention to seek out more diverse news was increased when the NRS processes were explained to the user in the front end design [46]. Another example is an article based on a systematic literature review distinguishing between different dimensions of news diversity, including topical and source diversity, but also other dimensions such as viewpoints and structural diversity [36]. Building on the notion of viewpoint diversity, recent works have attempted to use stance detection to capture the viewpoint across multiple topics [14], as well as propose multidimensional representations beyond stance [13]. The framing of diversity thus changed over the years, from a perception of diversity as necessary for not driving the user away from the site to more normative perceptions of diversity as a pre-requisite for a well-functioning NRS for citizen's democratic participation, including exposing the user to a broader set of views. Such a normative

view of journalism can be seen as related to normative role of journalism in the participatory and the deliberative models of democracy [49].

Despite the more normative turn, many of the articles operationalize diversity as exposure to diverse set of news items, while the more deliberate and participatory measures found in the article by Loecherbach et al. [36] are rare. For example, an article by Lu et al. argues that the values of news organizations should be included in the design of the NRS to counter the click driven optimization, but they define the values as 'the ability to surprise, to provide fresh and timely news, to yield more diverse reading behavior, increasing the number of items read' [37]. As such the article remains on the level of providing more diverse topics, while normative values such as focusing on problem solving, engaging citizens in public life or linking citizens together – all journalistic values from participatory and deliberate models of democracy – are absent across the literature.

7. What frames are Left out and with What Consequences

The findings above point to a specific way of framing diversity in relation to a very specific democratic role of journalism and a consequent way of operationalizing it in terms of exposure diversity, or exposing individuals with a variety of news, on a specific news site. A framing of diversity related to exposure to diverse topics can be seen as fulfilling the competitive model of democracy, which Strömbäck describes as focusing on 'political actors' and 'journalism acting as a watchdog' [49]. This means that much of the literature in our sample is leaving out frames of viewing journalisms normative role in the deliberative or participatory models of democracy, which tend to focus more on letting the citizen set the agenda, linking active citizens together or mobilizing citizens' participation in public discussions [49] (p. 341). Furthermore, the normative role of the critical watchdog, which is a part of Strömbäck's competitive and minimal normative model is not taken into account in the literature, as diverse content exposure limited to topics and viewpoints cannot secure exposure to critical journalism, exposing those in power for example.

While designing for diversity is important and necessary in the domain of news, the problem with such an approach is also that exposing individuals to a variety of news does not guarantee that they will click on and read diverse news. Audience research has historically shown that there is often a gap between the encoded intent of the media production and the decoding of this content by the audiences, who for example often resist this intent of the media organizations. Moreover, as suggested by Einarsson et al. [16] thinking between the boundaries of one specific news site does not take into consideration that individuals tend to have wider news repertoires and be aware of the editorial lines of the media they consume. The news diet of individuals may already be quite diverse in itself, not requiring ulterior diversification on the singular news sites. If an individual is used to reading about politics on one news site and about sport on another news site, recommending them with diverse news that do not relate to such topics may actually dissuade them from using the sites. As noted by Bodó et al. [9]: "underlying the filter bubble discourse is thus yet another, more implicit assumption, namely that diversity, and exposure to diverse news is inherently a good thing. It is worth noting that this assumption is not self-evident. Diversity can compete with other, not less important public or economic values, such as the need for reducing complexities, personal autonomy of the audience, and the provision of information of personal importance to the audience" (p.208).

Operationalizing the framing of diversity solely in terms of the competitive democratic role of journalism on one news site also comes with the normative assumption that especially political news needs to be part of the individual's main news diet. Indeed, concerns in the literature tend to be centered around individuals being exposed to enough politically relevant news, so they can fulfill their role as democratic citizens. The definition of 'the political' is however somewhat narrow, both in discussions and operationalizations of content diversity and viewpoint diversity. The political domain is actually the only domain where viewpoint diversity is operationalized, which usually tends to be done by making a distinction between leftwing and rightwing news. For example, Heitz et al. explains how they: "assessed two political dimensions—left/right and liberal/conservative—for each user based on more than 20 questions" [26] (p.1715). An exception is an article by [25], which

proposes two-dimensional viewpoint representation consisting of a viewpoint's stance on a nuanced level which reflects the degree to which a viewpoint opposes or supports a given topic, and a viewpoint's logic of evaluation, which reflects the perspective behind the stance. Nevertheless, securing exposure to different standpoints and thus multiple voices, does not take into account the voices not even heard in the article dataset, which research into the lack of representation in media research has highlighted for quite some years [20].

Even though the narrow distinction is most likely due to the limited ability of algorithms to detect and recognize other kinds of political views, such as pro-choice/pro-life or body-positive/body-shaming, it does not allow for an accurate operationalization or evaluation of the full scope of diversity of viewpoints which are implicitly embedded in news articles and play a role in the opinion formation of the individual. For example, the long history of framing analysis of media content has shown how issues are framed in often very subtle ways through specific use of language across a body of articles, for example framing women as emotional or immigrants as criminals. Such a framing occurs across the media landscape over time and thus not only in the individual article and provides the user with 'different windows to the world' [52], which is not taken into account in the diversity-by-design approaches. A similar argument can be found in the work of Sax who found that much of the literature draws on a narrow set of theories of liberal and deliberate democracy, emphasizing how conflicts should be solved in a rational manner, while ignoring more agonistic democratic models. Such an approach would stress the ineradicably of conflict and the need to make conflict productive [44].

Moreover, the focus on leftwing/rightwing news tends to privilege and overestimate the importance of the recommendation of hard political news, as opposed to other kinds of news, such as cultural, lifestyle and service. This seems to remediate the struggle of scholars working with different kinds of journalism for the recognition of the legitimacy of these kinds of journalism as public spheres hosting democratic discussions [24]. The evaluation of journalism strictly in connection to democracy where journalism is seen as watchdog, providing users with a variety of content to stay informed, means that only specific kinds of journalism, often connected to hard news reporting, have received thorough scholarly attention [51], while other kinds of journalism, such as service or lifestyle journalism, have been "relegated to the margins of academic inquiry" [22] (p. 5). However, some scholars have been arguing for the role of other kinds of journalism in the flourishing of the public sphere. Bird [6] argues that the softer kinds of news serve as incentive for broader social discussions and that "in its ritualistic, community-building role, trivial news allows us to interrogate the morality and dialogue with others about shared values" (p. 501). Some scholars, such as Thomas [51] have been working to anchor journalism in a different normativity than democracy, arguing that the conception of journalism centered around hard news reporting "does not reflect the different things that different journalisms do for different people" (p. 365). He proposes that the "first and most basic objective of journalism is to be helpful, where to be helpful is to expand and improve the opportunities of others" [51] (p. 365, emphasis in the original). Therefore, journalism can be considered helpful when it opens up opportunities for people, which did not exist or were not accessible before, through new knowledge or new skills [51]. In this we see the role of journalism described as more participatory and deliberative, which is a framing left out in most of the literature on NRSs, possibly because such forms of diversity are harder to measure and translate into computational code. As Vrijenhoek et al. [55] note: "An increasing number of media organizations have acknowledged the difficulties in translating their editorial norms into metrics that can inform recommender system design.

Different kinds of journalism have different roles in the lives of individuals and what emerges from our analysis is that diversity has been studied, designed, and evaluated only in connection to one of those roles, the democratic participatory one, but very much related to how to stay informed on a broad set of issues and topics. As such the operationalization of diversity secures a pluralist media system on the media site level. As much as it is true that people do read the news to get informed, it is also true that people read the news in order to form connections with their communities and to stay updated on their personal interests. In this sense, news does not only cover

a strictly political and democratic role in the lives of citizens, but also a more "ritualistic, community-building role" as argued by Elizabeth Bird [6] (p. 501). This kind of normative role is left out in by the way diversity is framed in NRS literature, which instead only focus on the strictly political and democratic role of news by making sure that individuals are exposed to enough hard political news or different political opinions. According to [22]: "There has long been a normative focus" (p. 2) on the link between journalism and politics, with a narrow understanding of what constitutes politics, and an underestimation of the role that softer kinds of journalism (such as service and lifestyle) can have on individuals and their contribution to the public sphere. As [21] claims, the agenda-setting role of news works also with the more "private problems" brought up in lifestyle journalism, "which means that the selection of specific problems and solutions has a civic impact" (p. 15). Such a framing is less prevalent in the literature on NRS.

Lastly, framing the solution in terms of diversity-by-design implies that the need of diversity in algorithmic news recommendation is an issue to be solved by computer scientists, rather than by journalists and editors. Journalists have historically sought to balance the distribution of news according to market driven values and more normative democratic values of 'informing the public' [39], but recent research suggests that such values are hard to integrate into the NRS design beyond the exposure to different topics. Such an exposure does not secure though, however diverse it might be, that news users are exposed to a commonality of issues across, and the risk might be that NRS re-enforce the tendency for audiences to end up in different segmented 'audience-islands' [35], with no bridges to connect them across the consumed content. In short diversity in exposure to topics or opinions does not hinder the emergence of filter bubbles across the 'inherently cross-mediated' [45] news landscape of the individual user even if framed as such in the literature. An article by Vrijenhoek et al. [55] highlights how the data science literature frames this issue as related to one specific site. The authors operationalize this as fragmentation, referring to 'the extent that users are frequently recommended the same items and therefor has a similar understanding of the content in the system' [5] (p.5). Ironically, exposing users to very diverse directions might have the opposite effect, as the user loses track of the issues of larger concern, or it might push the user away from a site, if the user has expectations of very niche content. This is likely the reason why news organizations limit NRS to specific spaces on the site and leave the top spaces for editors to curate manually, keeping 'the human in the loop' as a part of implementing algorithmic curation [40].

8. Conclusion

In this article, we have examined how diversity is framed in the large body of literature from Computer Science and Social Science. Answering RQ1 we showed how diversity is framed as an essential component of a well-functioning NRS, as it is framed as the solution to the filter bubble and potential polarization problem. However, diversity is most often operationalized as diversity of news topics and political viewpoints across the literature, of course with exceptions in more recent literature in particular. This seems to indicate an increasing focus on other and broader set of values as a part of the NRS design and evaluation, and future research should look more into how more qualitative normative values can be operationalized. Some research has already started looking into this, for example Lu et al. [37] investigated how organizational journalistic values can be implemented in the NRS design. An issue with designing NRSs in response to the filter bubble problem might be that user's use multiple sites and platforms for news, which means that the problem should not be solved on a single news site level.

The second section answered RQ2 and showed how the cause of diversity´s importance changed over time in the literature from initially being rooted in the individual users' lives, connected to their potential boredom and information overload, to the more recent literature framing diversity in NRS as connected to the democratic role of news. In this literature NRS are framed as providing an armor against filter bubbles and bias in information seeking. An issue is that some commonality in the recommendations is likely to ensure access to a broad public sphere, and future research should

examine how to balance commonalities in content across sites and services with potential bias in the user's information seeking practices.

Finally, the third section answered RQ3 by showing how the framing of diversity-by-design as a solution, leaves other frames out for a more journalistic evaluation of their recommendation, and the designing of NRS according to journalistic norms and values. But also more deliberative and participatory democratic models should be taken into account, when designing NRS, thus looking beyond mere diversity by exposure and towards diversity by consumption, and how the different NRSs allows for more community-building roles in societies. Deliberate and participatory models of democracy focus on letting the citizen set the agenda, linking active citizens together or mobilizing citizens' participation in public discussions, which might be important factors for news organizations to take into account when developing NRSs. Beginning from the lived experiences of individuals with journalism and the context in which news consumption takes place, for instance, would allow researchers to move beyond the analysis of diversity within a single site, to take into account the cross mediated news repertoires of users, as well as to gain a clearer picture of how individuals engage with the collective concerns beyond the consumption of hard political news and the impact of NRSs on such engagement.

Acknowledgements

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