News diversity reconsidered: A systematic literature review unravelling the diversity in conceptualizations

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ABSTRACT: Concerns about selective exposure and disinformation in the digital news environment have brought the concept of news diversity to the forefront of academic debates. Despite its growing prominence in scholarly work, however, news diversity often remains hard to grasp. The current paper aims to re-assess what the concept of news diversity means in an evolving news ecology. To do so, we draw on three dominant conceptualizations of news and media diversity. We use their strengths to unravel the variety in conceptualizations of news diversity and to explain how diversity is built on different conceptual and normative assumptions towards news media and democracy. Based on these insights, we perform a systematic literature review in which we map the current communication science literature that address news diversity. Results show that 43 different news diversity dimensions have been used in literature, indicating a form of academic cherry-picking with both normative and conceptual implications. We propose a way forward by formulating recommendations for future diversity research. This includes a shift to a more theoretically-grounded approach in conceptualizing news diversity, a call for interdisciplinary research, and giving the idea of normativity a more pronounced place in research on news diversity.

WORD COUNT: 7217 (excl. references and appendices)

Introduction

The role of mass media in the public sphere has changed significantly in the past decade, as gatekeeping – or the act of filtering and sharing newsworthy events – is increasingly shaped by platforms, peers and algorithms (Wallace, 2018). Non-journalistic actors such as platforms like Google and Facebook now increasingly control what information reaches society, how social reality is framed and shaped and how audiences can find, access and engage with news content (Nielsen, 2016; Wall, 2015; Wallace, 2018).

In consequence of these developments, an increasing number of citizens and (non-)governmental organizations have expressed concerns about the current state in which news is consumed, produced and curated (see e.g., European Commission, 2018; van Keulen, Korthagen, Diederen, & van Boheemen, 2018). In particular, concerns have been raised about news personalization, selective exposure and so-called 'filter bubbles' which are assumed to negatively affect news diversity (Zuiderveen Borgesius et al., 2016). As a consequence, several empirical studies have been bringing the concept of news diversity to the forefront of scholarly debates (see e.g., Courtois, Slechten, & Coenen, 2018; Dylko et al., 2017; Flaxman, Goel, & Rao, 2016; Fletcher & Park, 2017).

Despite its growing prominence in academic discourses today, however, little attention has been paid to the conceptualization of news diversity. Indeed, as Raeijmaekers and Maeseele (2015) already remarked, it generally remains unclear what is meant by referring to diverse media content or how diverse media should operate within democratic societies. Although this ambiguity is not a recent issue (see e.g., Napoli, 1999; Voakes, Kapfer, Kurpius, & Chern, 1996), its conceptualization becomes even more pressing in an evolving news ecology in which traditional assumptions underlying journalism studies may also change significantly.

With these concerns in mind, the current paper aims to re-assess what the concept of news diversity means in an evolving news ecology where gatekeeping practices are no longer exclusive to mass media and audiences are increasingly empowered to produce, distribute and consume content. To do so, we draw on widely used conceptualizations of news and media diversity (e.g. McQuail, 1987; Napoli, 1999; Voakes et al., 1996). We use their strengths to forward an approach for research to interpret, study and compare news diversity. As such, we aim to provide a clear-cut and in-depth understanding of what the assumptions underlying this concept are and how they could be taken into account. Moreover, we map the current communication science literature on news diversity on these assumptions by conducting a systematic literature review. This allows us to gain an overview of where we stand as a field, where the focus lies and where additional attention might be directed to.

Literature review

We start our literature review by discussing the most dominant approaches to media and news diversity. To select these approaches, we looked to the number of times these approaches have been cited in academic research databases such as Web of Science and Proquest as well as to their recurrence in the communication science literature (see Appendix 1 for an overview). As we aim to re-assess what the concept of news diversity means, we focus on conceptual approaches, rather than how diversity can be measured or operationalized (see e.g. Hellman, 2001; Junge, 1994; McDonald & Dimmick, 2003).

Conceptual approaches on news and media diversity

Napoli: the 'diversity chain', from source, via content to exposure

A first common conceptualization of media diversity is Napoli's 'diversity chain' (1999). Here, diversity consists of multiple components including source, content, and exposure diversity. Source diversity refers to the extent to which the ecosystem is populated by a diverse array of content providers and takes into account ownership and workforce diversity. Content diversity concerns the extent to which

the media content is diverse in terms of program-type format, demographics, and ideas and viewpoints. Finally, exposure diversity deals with the extent to which audiences receive a diverse array of content and sources, both in horizontal order (i.e., across all available sources) and vertical order (i.e., within individual sources).

Empirical research shows that Napoli's conceptualization provides a useful framework for understanding both the relationships between the different diversity dimensions and the relationship between exposure diversity and democratic citizenship. Van der Wurff (2011), for instance, has proposed using the diversity chain to understand the relationship between source and exposure diversity. He found that exposure to a variety of news outlets predicts the reception of diverse ideas to some extent, especially for lower educated audiences. In the same vein, Kim and Kwak (2017) found evidence that audiences' news media usage can be related to examining political knowledge and participation.

Voakes et al.: Internal diversity in term of source and content

A second popular approach to diversity is the conceptualization of media diversity by Voakes, Kapfer, Kurpius, and Chern (1996). They distinguish source diversity and content diversity within one single media product. Instead of Napoli's interpretation of source diversity, Voakes and colleagues used this term differently by referring to the journalistic sources used to create a news product. This includes the affiliations, status positions, and proximity of all actors presented or quoted in a given story or medium. Content diversity then is conceptualized as the dispersion of representation of ideas, perspectives, attributions, opinions, or frames within a news product, and the context of one particular issue. Hence, the frames and subframes used to provide context for the news are particularly interesting. More specifically, the notion of 'idea elements' is used to map the different views on a specific idea at a manifest level of analysis.

Research has shown that the framework of Voakes et al. provides a useful foundation to understand content diversity within a single publication or news media outlet. Masini and Van Aelst (2017), for instance, used this conceptualization to conduct a content analysis of the actor and viewpoint diversity within articles on immigration published by popular and quality newspapers. They found no significant differences in the level of actor and viewpoint diversity between the two types of newspapers. In the same vein, Carpenter (2010) used this conceptualization to understand how online citizen journalists contribute to the diversity of content by addressing different topics than online newspapers. However, she adapted the notion to an online environment by including the use of hyperlinks and the number of interactive elements present within the articles.

McQuail: Structure and performance diversity

McQuail (1987, 1992), finally, conceptualizes media diversity into two components: diversity at the level of structure and diversity at the level of performance. At the level of structure, he distinguishes three subcomponents: ownership (i.e., the extent of different and independent media firms or producers), format (i.e., different types of media such as press, radio or television) and geographical diversity (i.e., coverage of media for national, regional or local populations). At the level of performance, three general subcomponents are used: opinion, information, and culture. These subcomponents are formulated broadly as McQuail states that diversity of media content can be assessed according to numerous diversity dimensions, dependent on a set of priorities and values which characterize the society in question (McQuail & Van Cuilenburg, 1983). In general, opinion diversity refers to different political viewpoints. Information diversity is concerned with the different news and informational topics covered. Culture diversity deals with the genre, taste, style or format in culture and entertainment.

McQuail's work is acknowledged for its empirical usability in academic literature. Abdulla (2017), for instance, examined the diversity of the news coverage during the Egyptian presidential elections of

2012. In this study, diversity was primarily understood as the inclusiveness of different groups in terms of gender, ethnicity, religion, and other factors that make individuals or groups different from each other. Additionally, content dimensions were taken into account such as theme, geographical, story type, story size, objectivity and fairness and balance. Hence, based on McQuail's framework, Abdulla demonstrated that numerous diversity dimensions could be chosen, both at the level of structure and performance.

Assumptions underlying these approaches

When considering these approaches on news and media diversity, a historical distance can be noted between theoretical and empirical studies. On the one hand, there is the theoretical work on news and media diversity that is published at least 20 years ago, when digital communication technologies were still in its infancy. On the other hand, there is the recent empirical work on news and media diversity, which is built on these theories to assess the relationship between these digital communication technologies and news media or their audiences. Although such a historical distance is inevitable in scientific research, it is important to check whether the assumptions underlying these conceptual approaches are still pertinent to the current socio-technical context. To do so, we highlight the most prominent assumptions of these approaches by Napoli (1999), Voakes et al. (1996) and McQuail (1987, 1992) and discuss them in relation to the contemporary news media ecology.

We start with the conceptualization of Napoli (1999) whose theoretical justification lies in the metaphor of news as a marketplace of ideas. In this metaphor, citizens are free to choose from a wide range of opinions, delivered by a wide range of sources. Citizens are subsequently assumed to use these diverse offers to be more informed and more effectively involved in the democratic process. This process is also illustrated by the terminology (i.e., 'diversity chain') used by Napoli (1999), in which exposure diversity is placed at the end, indicating a sequential effect of source and content diversity on exposure diversity respectively. However, in this conceptualization, the rationale for considering source diversity does, in fact, not lie in ownership, but rather, as a means to obtain more content diversity. Hence, from this perspective, a diverse media system in terms of sources automatically leads to more diverse news content. This focus on source diversity is explained by the fact that policymakers cannot easily interfere with content production, while they can determine how the media system is structured (Napoli, 1999). In other words, source diversity functions as a policy proxy of content diversity. As Napoli acknowledges in later work (2011), this assumption is not unproblematic. New media ecologies such as the Internet are argued to produce higher levels of audience concentration than those in traditional media (Hindman, 2007; Horwitz, 2005; Voakes et al., 1996).

Another element to consider in this conceptualization deals with how audiences engage with news. In Napoli's conceptualization, this is captured in the third component, exposure diversity. In his understanding, exposure refers to the content 'as received' by the audience or 'what the audience actually selects' citing McQuail (1992, p. 158). Although some semantic differences might already be identified between 'receiving content' and 'selecting content', both descriptions have become too crude for the wide variety of people's behaviors today. In particular, digital news practices such as checking, monitoring, snacking and scanning do not involve any selection, but do fulfil valuable functions for newsreaders (Costera Meijer & Groot Kormelink, 2015; Groot Kormelink & Costera Meijer, 2018). Hence, this shows that audience behaviors require a more fine-grained vocabulary (Groot Kormelink & Costera Meijer, 2018) and, above all, that not all audience behaviors can be interpreted as one.

Moving on to the conceptualization of Voakes et al. (1996), there is an important assumption underlying Voakes' inclusion of internal diversity, or the choice to only assess diversity *within* one media product. Although this approach might give valuable insights, it does not afford to assess news diversity within the whole system. This is what McQuail and Van Cuilenburg (1983) refer to with their concept of external diversity: the extent of variation in content between media outlets. A media outlet might score low on internal diversity, but contribute significantly to the overall external diversity of

the ecosystem by offering a different viewpoint compared to the other outlets (Hellman, 2001). At the same time, the opposite can be true as well: multiple news outlets can be internally diverse with similar content, hence with a low external diversity of the overall news landscape (Hellman, 2001). In today's competitive news ecology this might be indeed the case, as it is argued that market mechanisms tend to produce 'more of the same' in accordance with consumer preferences (Hendrickx, 2020; Sjøvaag, 2014; Van Cuilenburg, 1999). Hence, it is worthwhile taking the differences *between* media outlets into account when assessing news diversity, as the value of some media outlets may lie there.

The following assumption relates to the nature of news content. Whereas Voakes et al. (1996) see news content as a static product made by journalists, news content is increasingly shaped through and for audience interactions. Hyperlinks, for instance, are increasingly provided by media outlets to navigate users through content that comes from other sources and thus potentially to a diversity of viewpoints (Lee, 2007; Carpenter, 2010). Moreover, news content is shaped by audiences through likes, shares, and comments, as these audience engagements are, for example, found to impact the credibility of news (Waddell, 2018). Yet audience engagement seems to be absent from each of those approaches.

To end this discussion, we focus on the conceptualization of McQuail (1987, 1992) and the holistic nature of the diversity dimensions. Although this might be the original strength of the conceptualization of McQuail (1987), it is open to different interpretations. This approach might lead to a form of cherry-picking or opportunism in future research in which specific diversity dimensions might be included or omitted without formulating congruent arguments. This is especially true in a news media ecology where operational methods increasingly steer the research design-choices, rather than conceptual considerations (De Grove, Boghe, & De Marez, 2020). This means that diversity dimensions such as location, gender or story length, which are relatively easier to measure, might be chosen more often. Diversity dimensions such as controversy, balance, objectivity or blame, in contrast, are more difficult to identify and thus might have a higher chance to be not chosen in diversity research.

General diversity assumptions

Building on the previous insights, we now formulate three general assumptions that might guide the discussion on what of news diversity means. These assumptions will also be used in our systematic literature review to categorize the studies.

Normative assumptions

A first assumption concerns the normative position of the researcher, or 'the optimal outcome' of diversity. In general, two standards have been used in literature to evaluate diversity outcomes: *open diversity* and *reflective diversity* (McQuail & Van Cuilenburg, 1983; Takens, Ruigrok, Van Hoof, & Scholten, 2010). Whereas open diversity claims diversity as an equal (media) representation of all possible categories, reflective diversity argues that media should reflect the proportions in society (McQuail, 1992). Take for instance research on the diversity of political opinions in the news. From an open point of view, diversity would be evaluated as an equal representation of all voices in the political spectrum. From a reflective viewpoint, evaluation of diversity would be based on the question to what extent these voices coincide with the current distribution of political opinions in society.

Explicating the choice between open and reflective is essential as both positions have different challenges, especially in a political context. For instance, evaluating news diversity from a reflective position oftentimes results in reinforcing the status quo and excluding voices of minorities (Karppinen, 2010). This might hamper citizens to learn about parties representing minorities and controversial political issues, which ultimately form the basis for social change (Takens et al., 2010, Van Cuilenburg, 1999). Evaluating news diversity based on openness raises a different challenge: how to deal with extremist voices. For instance, questions can be raised about the desirability of giving extremist voices

equal access to mainstream news media. In the context of news recommendation systems, this challenge becomes even more pressing as some scholars suggest that algorithms may play a role in (dis)encouraging online radicalization (Ledwich & Zaitsev, 2019).

Although literature primarily presents these normative standards as a dichotomy (McQuail & Van Cuilenburg, 1983; Takens, Ruigrok, Van Hoof, & Scholten, 2010), we argue that normativity cannot be seen as two distinct concepts – open diversity and reflective diversity - describing two sides of the same coin. Rather, it should be seen as a continuous sequence in which both concepts stand at the end of a continuum in which scholars may seek for a balance between open diversity and reflective diversity (see Figure 1). A continuum also better corresponds with how Bozdag and Poel (2013) or Van Cuilenburg (1999) perceives a media policy optimally performing: 'targeting at a position halfway between reflective and equal access diversity' (Van Cuilenburg, 1999, p. 192).

Open diversity   Reflective diversity

$\longleftarrow$ ——————————————————————————— $\longrightarrow$

Figure 1. A continuum describing the two normative standards to evaluate the optimal outcome of news diversity

Conceptual assumptions

The second group of assumptions relates to the main ideas and principles underlying the concept of news diversity. Unlike the normative assumptions discussing how diversity may be evaluated, the conceptual assumptions are directly related to how diversity can be investigated. This comes down to a distinction between what or who is selected (i.e. sample selection) and what is studied (i.e. diversity dimensions).

Sample selection - The sample selection is traditionally related to a choice between the production, in which news is made available, and the consumption side, in which citizens engage with news. However, in the current news media environment, secondary gatekeepers such as search engines, recommendation systems, and aggregators can also be studied. Möller, Trilling, Helberger, and van Es (2018), for instance, examined three different recommendation algorithms (i.e., semantic filtering, collaborative filtering and filtering based on overall popularity) and their effect on topic and sentiment diversity. More specifically, they compared the output of different algorithmic news recommendation for the same articles of the same news outlet. Hence, their selection goes beyond the production side towards an algorithmic curation side in which news can be in various ways selected, organized, and presented.

When studying news diversity, a choice between production, distribution or consumption seems quite straightforward, yet there are important challenges to take into account. A first challenge is related to 'the distance' (see Figure 2) between the aims of news diversity and the sample used to examine news diversity. For instance, if informed decision-making is considered to be the aim, then researchers preferably examine the consumption side, and more particularly the diversity in content audiences are exposed to. However, due to methodological or policy reasons, scholars oftentimes move away from the diversity in consumption, assuming that studying diversity in distribution or production also helps to understand how citizens stay informed. However, these samples are not decisive enough to steer informed decision-making.

Diversity in production   Diversity in distribution   Diversity in consumption

$\longleftarrow$ ——————————————————————————— $\longrightarrow$
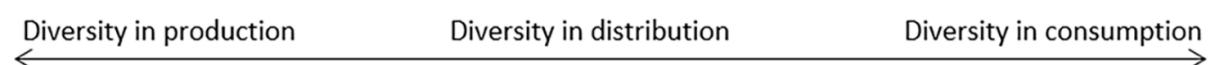
Figure 2. A continuum describing the three sample selection types of news diversity and their distance to the presumed aims of news diversity

Figure 2 visualizes the continuum of this challenge, from the diversity of the sources at the production side to the diversity of content at the consumption side. A position on the left implies a larger distance between the diversity of the research sample and presumed aim of news diversity (that is, informed decision-making). When studying news consumption, this distance is smaller. Ultimately, the guiding principle is to keep the distance between the aim the study and the selected study sample as small as possible. However, capturing news audience behavior, and how they make sense of news messages, has been argued to be challenging (de Vreese & Neijens, 2016; Groot Kormelink, 2019). Audiences have limited cognitive capabilities about the content they have consumed (Gunter, 2012). For instance, simply asking how divers the news they consumed was is in terms of viewpoints or opinions is likely to lead to invalid answers.

A second challenge relates to the production side where scholars have to choose between investigating news diversity *within* individual articles or sources or *between* separate articles or sources in a given media system. This choice is also known as internal and external diversity respectively (Hellman, 2001; McQuail & Van Cuilenburg, 1983). Whereas internal diversity offers insights into the performance of individual media outlets, external diversity focuses on the breadth of diversity choices consumers have in a media system as a whole (Hellman, 2001; van der Wurff, 2011). Hence, they each offer another perspective on how diverse the current news landscape is and thus they should be both carefully taken into account when selecting and evaluating the production side.

Diversity dimensions - The diversity dimensions relate to the most fundamental part of what constitutes news diversity. It concerns the focus of analysis, which centers on dimensions in the content or structure of news media. Concerning the content dimensions, for instance, there are numerous possibilities for researchers to investigate. Some authors use actor diversity to conceptualize news diversity in content (see e.g., Humprecht & Buchel, 2013; Masini & Van Aelst, 2017; Nord, 2013; S. Rodgers, Thorson, & Antecol, 2000). In general, this dimension is concerned with the affiliation or occupation of the actors who are quoted or paraphrased in the news. Another diversity dimension is party diversity. Several studies have used this dimension to count the number of political parties across which a medium distributes its attention, either implicitly in terms of topics or explicitly in terms of party name (see e.g., Nord, 2013; R. Rodgers, Hallock, Gennaria, & Wei, 2004; S. Rodgers et al., 2000; Takens, Ruigrok, van Hoof, & Scholten, 2010; van Hoof, Jacobi, Ruigrok, & van Atteveldt, 2014).

Despite the wide range of (combinations of) diversity dimensions, most studies only focus on a handful of dimensions. A choice between these dimensions is based on the different conceptual (and normative) assumption towards pluralism, media and democracy (Raeijmaekers & Maeseele, 2015). Research concerning a balanced media representation of social diversity, for instance, will primarily focus on diversity dimensions such as actors, issues and viewpoints (Raeijmaekers & Maeseele, 2015). In contrast, research that relates to the diversity of identities or concerns will focus on the ways different identities and concerns are discursively portrayed (Raeijmaekers & Maeseele, 2015). This includes quantity dimensions such as gender, ethnicity and religion as well as quality dimensions such as objectivity or the use of arguments.

Another determinant which might explain which diversity dimensions are chosen is the set of priorities and values that characterize the society involved (McQuail & Van Cuilenburg, 1983). Take for instance the geographic location of a news story. In the early days of news media, this diversity dimension might have been not relevant. However, today, in a globalized and digitized news environment in which the pressure on local news media increases (Rouger, 2008; Williams, Harte, & Turner, 2015), attaining diversity between local and international news might be of increased importance.

Systematic review: mapping current literature on news diversity

As the literature review has shown, the literature on news diversity is built on different normative and conceptual assumptions towards news media and democracy. To understand where we currently stand as a field and where additional attention might be directed to, a systematic literature review was conducted based on the assumptions outlined in the previous section. A systematic literature review can be understood as a scientific method used to limit systematic error, or bias, by critically appraising and structuring all relevant studies following a predefined protocol (Petticrew & Roberts, 2006). Therefore, we present in this section our research protocol, including a description of, and rationale for, the process and methods we used.

Research protocol

The first step of a systematic review is a systematic search. Our search was conducted during March 2018 in three major, electronic databases: (1) Web of Science, (2) Proquest and (3) EBSCOhost. It was restricted to English-written and peer-reviewed literature articles in communication sciences. No restrictions were placed on the publication date or document types. All search strategy strings were developed through the use of general search retrieval principles such as truncation (i.e., the use of an asterisk), Boolean operators (e.g., AND, OR, NEAR), nestings, proximity searching and synonym listings. This was an iterative process in which the studies identified from early searches were used to refine the search strategy. To explain how this took form and how guiding concepts such as sensitivity and specificity were taken into account, we recorded the development process (see Appendix 2) (Petticrew & Roberts, 2006). The final search strategies strings are presented in Table 1. No additional studies were identified through hand searching or expert recommendations.

**Table 1.** Search strings used to collect studies on news diversity

Database	Search String
Web of Science	(TS=((news* OR media) NEAR/10 (divers* OR plural*)) AND TS=(news*) AND SU=(Communication) AND language: (English)
EBSCO host	AB news* N10 divers* OR AB news* N10 plural* OR AB media N10 divers* OR AB media N10 plural* AND AB news*
Proquest	AB((news* OR media) NEAR/10 (divers* OR plural*)) AND AB(news*)

Note: Web of Science advanced field tags: TS= Topic; SU= Research Area

Our systematic search and development of search strings include some important premises. A first one is concerned with the exclusive focus on communication science literature, even though several other fields (e.g., law and policy, computer sciences) have used the concept of diversity as a central concept to study as well (Loecherbach, Moeller, Trilling, & van Atteveldt, 2020). Despite their relevance, the main aim of this review is to understand where the field of communication sciences stands. As such, we focus on communication sciences, which is in line with the journal's main scope.

A second premise relates to the use of the concept of 'pluralism' as a synonym for 'diversity'. For this premise, we acknowledge that this contrasts with what theory suggests, namely that there is a distinction, or possible hierarchy, between these two concepts (see e.g., Karppinen, 2007; Raeijmaekers & Maeseele, 2015; Sjøvaag, 2016). However, it may be possible that empirical research uses the concept of pluralism while they are focusing on empirical differences (i.e., diversity) in their research or, vice versa, using the concept of diversity while discussing ideological differences (i.e., pluralism) (Raeijmaekers & Maeseele, 2015). As such, for the sake of completeness, we collected articles on both concepts. The same rationale applies to the use of the concept of media as a synonym for news. To include this synonym, we included the concept of media in our search strings as well.

The use of these search strings in the databases Web of Science, EBSCO and Proquest resulted in respectively 293, 548 and 186 studies. From these 1027 articles, 130 duplicates were removed, resulting in 897 studies to be screened for the topic of news diversity. Figure 3 gives a visual presentation of the selection process of the articles on news diversity we selected for the literature review.
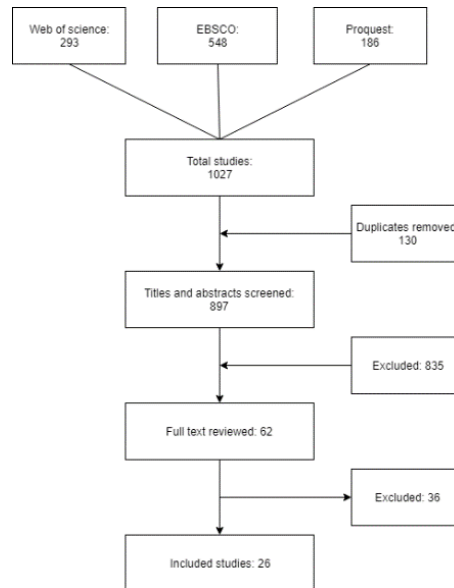
Figure 3. Flowchart selection process

A second step consisted of the actual screening process. First, title and abstract were reviewed based on three inclusion criteria: the subject of the study (i.e., diversity or pluralism), the field of application (i.e., news) and the level of specificity (i.e., concept, no specific diversity dimension or measures). This screening phase resulted in 62 studies that were found eligible based on title and abstract. A second reviewer independently re-conducted this screening for 400 random studies to get an indication of whether the first reviewer had missed any relevant studies. There was a moderate agreement between the two reviewers' judgements, $\kappa = .403$ (95% CI, .231 to .575), $p < .005$ (Altman, 1991; Landis & Koch, 1977). Differences in judgment were resolved through a consensus procedure in which the absence and presence of all criteria in the abstract were discussed. This procedure resulted in full agreement. Second, the first reviewer determined the eligibility of all suitable or doubtful studies based on full text. This screening kept 26 studies and excluded 36 full papers. A complete list of these studies can be found in table 3.

To map the literature on the different assumptions, a coding scheme was developed (see Table 2). This scheme consists of leading questions that might also be used in future diversity research to explicate the researcher's assumptions towards news diversity.

Table 2. Coding scheme for mapping news diversity, distinguishing normative and conceptual assumptions

Assumption	Leading question
Normative assumption: *normative position*	Should news media reflect the diversity in society, or should it treat all categories under study equally?
Conceptual assumption: *sample selection*	What or whom is studied: production, consumption or distribution?
Conceptual assumption: *diversity dimensions*	Which dimensions in news media content (e.g., gender, sentiment) or structure (e.g., ownership) are studied?

Results

Normative assumptions – In total, only five studies made their normative assumptions towards diversity explicit (i.e., Abdulla, 2017; Nord, 2013; Shumow & Vigon, 2016; Takens et al., 2010; van Hoof et al., 2014). Predominantly, reflective diversity, or the idea that media should reflect the proportions in society, was chosen as a normative standard to evaluate the diversity outcomes (see Table 3). Scholars, however, referred to type of diversity differently, which resulted in difficulties to discover their normative assumptions as well. Masini and Van Aelst (2017), for instance, made use of the mirror metaphor to make their normative assumption explicit: 'we opt for a division of actors by categories that mirror the main existing groups in society' (p. 109). Shumow and Vigon (2016), in contrast, refer to the 'actual match between users' preferences and the reflection of these preferences in media content' (p. 56), citing Van Cuilenburg (2000).

Table 3. Mapping normative and conceptual assumptions towards diversity in literature (in alphabetic order)

	Normative assumptions		Conceptual assumptions: sample selection		
	Open	*Reflective*	*Production*	*Consumption*	*Distribution*
Abdulla (2017)	X		X		
Alexander and Cunningham (2004)			X		
Bae (2000)			X		
McCombs (1987)			X		
Carpenter (2010)			X		
Carroll et al. (1997)			X		
Davie and Lee (1993)			X		
Day and Golan (2005)			X		
Dubois and Blank (2018)				X	
Humanes et al. (2013)			X		
van Hoof et al. (2014)		X	X		
Humprecht and Buchel (2013)			X		
Kim and Kwak (2017)				X	
Lee (2007)			X		
Masini and Van Aelst (2017)		X	X		
Nestvold (1973)			X		
Nord (2013)	X	X	X		
J. Peter and C. H. de Vreese (2003)				X	
Powers and Benson (2014)			X		
Pritchard (2001)			X		
R. Rodgers et al. (2004)			X		
S. Rodgers et al. (2000)			X		
Shumow and Vigon (2016)		X	X		
Takens et al. (2010)			X		
Voakes et al. (1996)			X		
van der Wurff (2011)				X	

Sample selection – In total, 22 studies investigated news diversity on the production side. Only four studies focused on the consumption side, in which citizens engage with news. Not a single study in our systematic review looked at distribution, where for example search engines, recommendation systems and aggregators could serve as the unit of analysis.

Diversity dimensions – A systematic search of the literature identified 43 different diversity dimensions which have been used to measure the concept of news diversity. Appendix 3 provides an overview of these dimensions and their descriptions. Despite this relatively large amount of diversity dimensions, we found remarkable differences among these dimensions in terms of popularity and appearance. To have a clear understanding of these aspects, we created a treemap (see Figure 4) in which all dimensions are visualized: the size of the blocks represents the popularity and the color of each block represent the number of synonyms that were used in the literature. Appendix 4 details which dimensions are used in the literature and how we classified them to develop our treemap.

As the research methodologies of several studies in our study sample were often ambiguously described, we experienced some difficulties to categorize these diversity dimensions in the exact meaning of the author's interpretation. This issue was especially true for studies which were concerned about the relationship between (content) diversity such as topic, geographic origin of the story and source-related dimensions such as market size, system source, story- or production source and ownership (e.g., Davie & Lee, 1993; Humanes, Sánchez, de Dios, & López-Berini, 2013; Shumow & Vigon, 2016). In order to select and review their relation with the concept of news diversity, we decided to take all these diversity dimensions into consideration and marked those diversity dimensions with a limited methodological description with an asterisk (see Appendix 4).
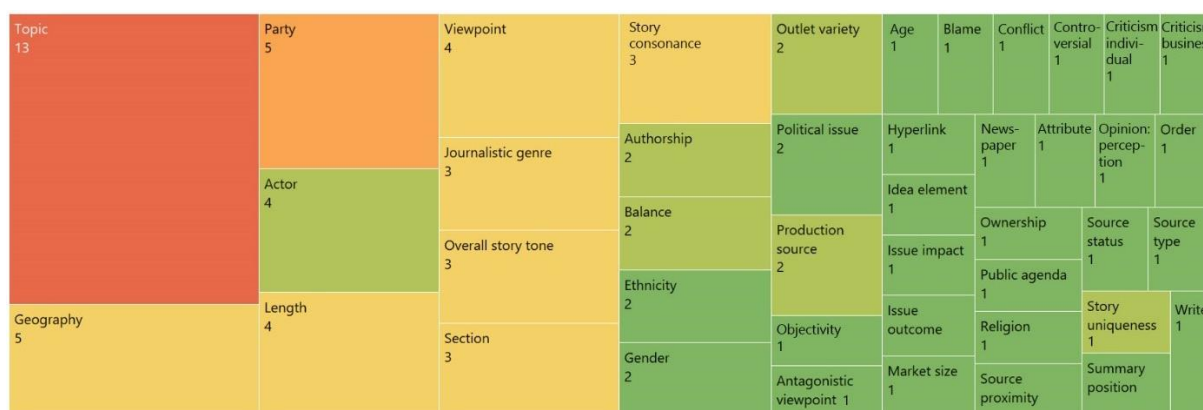
Figure 4. Treemap of diversity dimensions. Size reflects the frequency of studies found, and color represents the number of synonyms referring to the same dimension (green = min. value, red = max. value)

The treemap shows ten 'large' blocks indicating the diversity dimensions that have been used by more than two studies. The most frequently used diversity dimension is by far the dimension 'topic diversity' which has been used fourteen times. Despite the popularity of some diversity dimensions, several synonyms have been used to refer to the same dimension. Appendix 4 shows how we categorized each dimension. Most remarkable is the concept of topic diversity for which six different labels have been used in literature: topic (Bae, 2000; Carpenter, 2010; Carroll et al., 1997; Humprecht & Buchel, 2013), frame (Voakes et al., 1996), issue (Day & Golan, 2005; Nord, 2013), theme (Abdulla, 2017; Humanes et al., 2013), subject (R. Rodgers et al., 2004; Ya-Ching, 2007), item (McCombs, 1987) and topical foci (Powers & Benson, 2014). Other examples in which the number of synonyms is higher than three (i.e., orange color in Figure 4) are party and story uniqueness.

Although most dimensions differ strongly from each other in terms of their meaning, some dimensions were more closely related to each other. The diversity dimensions uniqueness (or non-duplication) and consonance (or duplication), for instance, seem at first sight to be two sides of the same coin. However, taking into account their theoretical justifications, it is evident to keep them separate. On the one hand, studies measuring uniqueness interpreted diversity primarily as a means media companies may use to differentiate themselves from other competitors. On the other hand, studies measuring consonance or duplication perceive diversity more as 'an outcome of news values and news treatment

which are steered by an increasing pattern of mergers, acquisitions, and consolidation' (Carroll et al., 1997, p. 133).

Discussion

In this article, we investigated what the concept of news diversity means in an evolving news ecology. We explored the most commonly used approaches on news and media diversity and reviewed their theoretical justifications and assumptions in light of an evolving news ecology. This resulted in three overarching assumptions: the normative goal, sample selection and investigated diversity dimensions. Subsequently, we mapped the current literature on news diversity on these assumptions by conducting a systematic literature review. Based on the overlaps and voids found in this review, some conclusions and recommendations can be made on respectively current and future news diversity research.

First, current news diversity research is largely incomparable due to different conceptualizations. In particular, our results show that each study uses a different (combination of) diversity dimension(s) to measure news diversity, leading to no less than 43 different diversity dimensions and 26 different conceptualizations. This runs the risk of comparing apples and oranges when reviewing the outcome of news diversity research. This issue is especially crucial for the ongoing (policy) debates in which the effects of pre-selected personalization have been discussed (see e.g., Zuiderveen Borgesius et al., 2016). Without considering the conceptual assumptions, scholars may only look at the results of specific news diversity dimensions, yet draw conclusions on news diversity in general. This may lead to invalid recommendations to stakeholders such as policymakers.

In that respect, future diversity research should be more reluctant to hypothesize on news diversity in general. Such conclusions are exclusively assigned to systematic literature reviews, which can take into account the heterogeneity of studies in terms of, for example, sample, methods and participants (Petticrew & Roberts, 2006). To this end, communication sciences would benefit from such systematic literature reviews to map out areas of uncertainty or neglect for specific phenomena. For instance, in the discussion on personalized news and its impact on the diversity of content people are exposed to (cf. filter bubble), a review of all empirical studies related to this topic might reveal which dimensions are (not) being used and how they are measured.

In the same vein, we also suggest reducing the use of the general term 'news diversity' or unclear subcategories, such as 'content diversity' or 'source diversity', as these terms are too crude for the wide variety of dimensions that exist. Instead, we suggest distinguishing between the different dimensions of news diversity. More specifically, this means that scholars should use the term 'party diversity' when measuring the number of political parties across a medium distributes its attention, or the term 'sentiment diversity' when measuring the feeling of a news article towards an issue. Doing so, we believe that scholars would become more aware of the multidimensionality of the concept of news diversity.

Second, there is an over- and under-representation of particular dimensions without any theoretical justification. For instance, diversity dimensions such as location, gender or story length are notably more frequently chosen than other diversity dimensions. This disproportion might be explained by the fact that operational methods increasingly steer the research design-choices in practice rather than conceptual considerations, as they are, for example, 'easier' to investigate (De Grove et al., 2020). Diversity dimensions such as controversy, balance, objectivity or blame, in contrast, are more challenging to identify, which might explain why these are less investigated.

Theoretically, an operational-oriented approach of news diversity could affect the general interpretation of the mere concept, as ideally, conceptual considerations should steer operationalization, rather than practicalities. Studies such as Carpenter's (2010), for instance, clearly start from a theoretical stance to conceptualize news diversity. In particular, she uses the presence of

different publication types as a motive to re-assess and conceptualize content diversity into (1) the diversity of topics, (2) the use of outbound hyperlinks and (3) the inclusion of multimedia and interactive elements. Similarly, we argue that future research should refocus attention on the concept's original theoretical foundations and its presence in the current news ecology. Methodological difficulties will appear, but should not be a reason for not taking the first step. Instead, collaboration with other disciplines might be beneficial. For example, by tackling these difficulties with computational linguists who have expertise in Natural Language Processing (NLP), and particularly in content extraction from text.

Third, the investigated news diversity dimensions do not correspond with the current practices of news production, distribution and consumption. For instance, news audiences are increasingly enabled to engage with news articles in today's digitized news ecology. Unlike traditional news use, where news consumption was the end of the journalism chain, audiences can now contribute to and share news by sharing, liking and commenting news articles (Costera Meijer & Groot Kormelink, 2015; Lowrey & Gade, 2012). Consequently, the concept of news diversity should include diversity dimensions that go beyond reading news articles. This includes, but is not limited to, all behavioral and technical news affordances such as liking, sharing and commenting. In fact, when aspiring an informed citizenry, news diversity dimensions might also focus on how audiences differently interpret news frames and ideas, for instance (see e.g. Pascal Verhoest & Slaets, 2018). As we know from cognitive psychology, (news) interpretation processes are significantly influenced by our mental schemas and predispositions (Shen, 2004). Consequently, as Verhoest et al. (2017) explain, we cannot assume that those mental schemas will decode news messages in the same way as was done by any other. Different interpretations might be given to a similar image (Pascal Verhoest & Slaets, 2018), leading to news diversity 'in the head' of news audiences.

Finally, it is important to point out the lack of a normative standard for evaluating diversity research in most studies. In particular, out of 26 studies, only five studies explicated their normative goal. Whereas we acknowledge that diversity research starts with describing the results 'as is', without taking a position on what the 'optimal outcome' of diversity is, we believe that journalism scholars do have a normative idea of the desired goal when investigating news diversity. However, by disguising these ideas, it generally remains unclear how these results should be interpreted, let alone which normative assumption is dominant to the field. This ambiguity is problematic as conclusions on normativity have the most important value to the democratic notion of news diversity. It is therefore important for future studies to answer fundamental questions that ask how diverse news media should ideally operate within democratic societies or what the (dis)advantages are of both normative positions (i.e. open and reflective diversity) on democracy. The importance of answering these question becomes even more important in the context of news recommendation systems that benefit from clear-cut positions.

Limitations

This paper focused on conceptual approaches rather than how news diversity can be measured or operationalized. The latter, however, is at least as important as conceptual considerations and should be also considered carefully when researching news diversity. News diversity dimensions such as story consonance or party diversity, for instance, can be measured in several ways by using a different formula. Hence, before researching news diversity, it is advisable to review the current literature to prevent operational confusion (see e.g., Hellman, 2001; McDonald & Dimmick, 2003).

Another limitation is concerned with the research methodologies of the studies in our study sample. In line with the comments of Raeijmaekers and Maeseele (2015), we remarked that these methodologies are often ambiguously described and composed in such a way that it is unclear which diversity dimensions are related to the concept of diversity in the exact meaning of the author's interpretations. Consequently, we were not always able to replicate the conceptualizations of all studies unambiguously (see Appendix 4). However, this limitation should be rather seen as a

recommendation for future diversity research: making all assumptions, both normative and conceptual, explicit is an important prerequisite for each scholar who is conducting news diversity research.

Another recommendation for future diversity research is to replicate this study in other fields. As previously stated, this paper focused on the communication sciences literature, although several other fields (e.g., law and policy, computer sciences) have used the concept of news diversity as a central concept to study (Loecherbach et al., 2020). We assume that the inconsistencies found in this study might also occur in other fields due to the complexity of this concept. As such, similar literature reviews in other fields would be helpful to unravel the diversity in conceptualizations of these fields as well.

Research details

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Appendices

Appendix 1. Overview of references used by our study sample to conceptualize or define the concept of news diversity (in alphabetic order)

Author(s)	Reference(s)	Number of times cited		
		Web of Science	Proquest	EBSCO
Abdulla (2017)	Napoli (1999)	126	65	45
	McQuail (1992)	n/a	152	n/a
	Vergeer (2005)	n/a	n/a	n/a
Alexander and Cunningham (2004)	n/a	n/a	n/a	n/a
Bae (2000)	Scherer and Ross (1990)	n/a	394	n/a
McCombs (1987)	n/a	n/a	n/a	n/a
Carpenter (2010)	Voakes et al. (1996)	34	19	17
Carroll et al. (1997)	n/a	n/a	n/a	n/a
Davie and Lee (1993)	Atwater (1984)	27	4	19
	Lacy (1987)	57	16	52
	Lacy et al. (1989)	n/a	n/a	14
	Lacy et al. (1988)	n/a	n/a	7
	Litman (1979)	n/a	8	n/a
Day and Golan (2005)	Golan and Wanta (2004)	n/a	4	8
	Hallock and Rodgers (2003)	n/a	n/a	n/a
	Song (2003)	n/a	n/a	n/a
Dubois and Blank (2018)	n/a	n/a	n/a	n/a
Humanes et al. (2013)	Council of Europe (1994)	n/a	n/a	n/a
	Hallin and Mancini (2004)	n/a	426	n/a
van Hoof et al. (2014)	Hellman (2001)	n/a	n/a	n/a
Humprecht and Buchel (2013)	McDonald and Dimmick (2003);	73	31	24
	Van Cuilenburg (2000)	n/a	n/a	n/a
Kim and Kwak (2017)	Napoli (1999)	126	65	45
Lee (2007)	Junge (1994)	24	6	n/a
	McDonald and Dimmick (2003)	73	31	24
	McDonald and Lin (2004)	12	n/a	7
Masini and Van Aelst (2017)	Van Cuilenburg (1999)	n/a	15	16
Nestvold (1973)	n/a	n/a	n/a	n/a
Nord (2013)	McQuail (1992)	n/a	152	n/a
Peter & De Vreese (2003)	Allen and Izcaray (1988)	13	10	10
	Shannon (1948)	n/a	n/a	n/a
Powers and Benson (2014)	Benson (2009)	n/a	23	n/a
	Esser and Umbricht (2013)	n/a	n/a	12
	Hallin and Mancini (2004)	n/a	426	n/a
	Wessler et al. (2008)	n/a	n/a	n/a
Pritchard (2001)	n/a	n/a	n/a	n/a
R. Rodgers et al. (2004)	n/a	n/a	n/a	n/a

Note: selected author(s)/studies based on the study sample used to perform our systematic review; search 'number of times cited' conducted in April 2020

Appendix 1. Overview of references used by our study sample to conceptualize or define the concept of news diversity (in alphabetic order) (continued)

Author(s)	Reference(s)	Number of times cited		
		Web of Science	**Proquest**	**EBSCO**
S. Rodgers et al. (2000)	Jacklin (1978)	8	3	n/a
	Voakes et al. (1996)	34	19	17
Shumow and Vigon (2016)	Iosifides (1999)	23	10	7
	Just (2009)	34	72	6
	Kleiman (1991)	n/a	5	2
	van der Wurff (2011)	n/a	2	1
Takens et al. (2010)	Hellman (2001)	n/a	n/a	n/a
	Rössler (2007)	n/a	n/a	n/a
Voakes et al. (1996)	Griswold (1990)	n/a	n/a	n/a
van der Wurff (2011)	Hellman (2001)	n/a	n/a	n/a
	McQuail (1992)	n/a	152	n/a
	McQuail and Van Cuilenburg (1983)	n/a	n/a	n/a
	Napoli (1997, 1999)	29	n/a	n/a
	Napoli (1999)	126	65	45
	Porto (2007)	29	16	11

Note: selected author(s)/studies based on the study sample used to perform our systematic review; search 'number of times cited' conducted in April 2020

Appendix 2. Search string development for systematic literature review

Search string	Leading question	Result	Insight
TS=(news AND divers*)	Starting point: search string with Boolean operator (AND) and truncation (*)	1515	Bad result in terms of specificity: too high proportion of studies that were retrieved, that were not relevant
TS=(news **NEAR/15** divers*)	Is it better if we specify the relationship between news and diversity? - Proximity searching 1.0	430	Yes, better result in terms of specificity.
TS=((news **OR media**) NEAR/15 (divers*))	Can we include media diversity into our search string?	5574	Yes, but bad results in terms of sensitivity: media diversity is a too large field of study.
TS=((news OR media) NEAR/15 (divers*)) **AND TS=news**	Is it better if we restrict the concept of media diversity into the field of news?	583	Yes, better result in terms of sensitivity.
TS=((news OR media) NEAR/15 divers*) AND TS=news*	Can we broaden the scope of our search string to news <u>media</u> (i.e., extra truncation)?	654	Yes, this is better in terms of sensitivity, but be aware of specificity.
TS=((news* OR media) NEAR/15 divers*) AND TS=news*	Can we broaden the scope of our search string to news <u>media</u> (i.e., extra truncation)?	836	Yes, this is better in terms of sensitivity, but be aware of specificity.
TS=((news* OR media) NEAR/15 (divers* OR **plural***)) AND TS=news*	Can we make use of a synonym of diversity?	961	Yes, this is better in terms of sensitivity, but be aware of specificity.
TS=((news* OR media) **NEAR/5** (divers* OR plural*)) AND TS=news*	Is it better if we specify the relationship between news and diversity? - Proximity searching 2.0	523	No, bad results in terms of specificity. Studies that might be relevant, disappear. For instance: (Carpenter, 2010), (Kiernan, 2016) and (Masini, 2017)
TS=((news* OR media **OR source OR content**) NEAR/5 (divers* OR plural*)) AND TS=news*	Can we make use of more concrete aspects of diversity/pluralism?	654	No, researcher should not determine how diversity can be conceptualized.
TS=((news* OR media) **NEAR/10** (divers* OR plural*)) AND TS=news*	Is it better if we specify the relationship between news and diversity? - Proximity searching 3.0	778	Yes, added value in terms of specificity.
TS=((news* OR media **OR information OR journal***)) NEAR/10 (divers* OR plural*)) AND TS=(news* **OR journal***)	Can we make use of synonyms for media?	1.909	No, no added value in terms of sensitivity.
(TS=((news* OR media) NEAR/10 (divers* OR plural*)) AND TS=(news*)) **AND LANGUAGE: (English)**	Can we restrict the studies retrieved from our search to peer-reviewed, English-written studies?	686	Yes
(TS=((news* OR media) NEAR/10 (divers* OR plural*)) AND TS=(news*) **AND SU=(Communication**)) AND LANGUAGE: (English)	Can we restrict the studies retrieved from our search to the communication field?	293	Yes

Appendix 3. Description of all diversity dimensions used in literature (in alphabetic order)

Diversity dimension	Authors	Description	Source	Category examples
Actor	Humprecht and Buchel (2013); Masini and Van Aelst (2017); Nord (2013); S. Rodgers et al. (2000)	The range of category affiliations of actors who are quoted or paraphrased in the news: what is the affiliation or occupation of the actors involved?	Masini and Van Aelst (2017)	e.g. Political state authority; Economic bank; Activist
Age	S. Rodgers et al. (2000)	To which age group do the actors involved belong?	n/a	e.g. Children; Adolescent; Adults
Antagonistic viewpoint	Kim and Kwak (2017)	The number of political content across a reader distributes its attention: how many political content categories does a user read/watch/listen?	Kim and Kwak (2017)	n/a
Attributes	Carpenter (2010)	The number of attributes in a story (e.g. video, audio, slideshows, photographs, information graphics, graphics, maps or polls): how many story attributes are used?	Carpenter (2010)	n/a
Authorship	Day and Golan (2005); Powers and Benson (2014)	What is the relationship between the author and the publisher?	n/a	e.g. Guest contributor; Regular columnist; Wire service
Balance	Abdulla (2017); S. Rodgers et al. (2000)	A balanced (i.e., two- or multi-sided) story contained multiple viewpoints and a nearly equal number of sources for each side of the issue: how many viewpoints, or sides are represented?	S. Rodgers et al. (2000)	e.g. Not fair/balanced; Somehow fair/balanced
Blame	S. Rodgers et al. (2000)	Finding fault with, or assigning responsibility to an individual, group of individuals, business or organization for a negative outcome: does the content blame someone and if yes, who?	S. Rodgers et al. (2000)	e.g. Individual blame; Business blame
Conflict	S. Rodgers et al. (2000)	A process of interaction among social roles, based upon disparities in views or positions about ends, means, or means-ends relationship: does the content collide the interests or ideas of sources or characters?	S. Rodgers et al. (2000)	e.g. Conflict; No conflict
Controversial	R. Rodgers et al. (2004)	Does the content has a controversial nature?	n/a	e.g. Controversial; Non-controversial
Criticism individual	Day and Golan (2005)	Whether the article criticized an individual politician, judge, religious figure, advocate, academic, individual citizen or other.	Day and Golan (2005)	e.g. individual politician; judge; religious figure
Criticism organization	Day and Golan (2005)	Whether the article criticized a political, legal, religious, advocacy, academic or other body or organization or society as a whole.	Day and Golan (2005)	e.g. political organization; legal organization; religious
Ethnicity	Abdulla (2017); S. Rodgers et al. (2000)	What's the ethnicity of the actor(s) involved?	n/a	e.g. Bedouins; Nubians
Gender	Abdulla (2017); S. Rodgers et al. (2000)	What is the sex of the actor(s) involved?	n/a	e.g. Man; Woman

Appendix 3. Description of all diversity dimensions used in literature (in alphabetic order) (continued)

Diversity dimension	Authors	Description	Source	Category examples
Geography	Abdulla (2017); Bae (2000); McCombs (1987); Carroll et al. (1997); R. Rodgers et al. (2004)	What is the location of the story and what is its relation to the location of the news outlet?	n/a	e.g. Local; State; National
Hyperlink	Carpenter (2010)	A word, phrase, picture, or icon in news content on which a user may click to move to a different website: how many hyperlinks were used?	Carpenter (2010)	n/a
Idea element	Voakes et al. (1996)	This content concerns which stance?	n/a	e.g. Minimum age will reduce death; Local economy will suffer from taverns lost business
Issue impact	Day and Golan (2005)	Whether the article discussed the social, moral, political, legal, individual or other impact of the issue: in which domain do the discussed issue has an impact?	Day and Golan (2005)	e.g. Social; Moral; Political; Legal; Individual
Issue outcome	Day and Golan (2005)	Whether the article called for a change in the status quo or supported the status quo. How does the content relate to the state of affairs with regard to social or political issues?	Day and Golan (2005)	e.g. Change; Support
Journalistic genre	Humanes (2013); Abdulla (2017); Powers and Benson (2014)	The position of the journalist in relation to the action or the actor of the news story: what's the nature of the content?	Humanes (2013)	e.g. Descriptive; Interpretative; Critical
Length	Humanes et al. (2013); Carroll et al. (1997); Abdulla (2017); Nestvold (1973)	The extent from beginning to end: how long is the content?	n/a	n/a
Market size	Carroll et al. (1997)	The rank-order of the Standard Metropolitan Statistical Area (MSA) assigned to the geographic region	Carroll et al. (1997)	e.g. Major; Large; Medium
Newspaper	Day and Golan (2005)	Titles, broadcasts, brands: Who published it?	Day and Golan (2005)	e.g. New York Times; Washington Post
Objectivity	Abdulla (2017)	Content should not feature word meanings that harass, libel, or incite negative emotions towards the group mentioned: is the content based on these criteria considered as 'objective'?	Abdulla (2017)	e.g. Not objective; Somehow objective; Objective
Opinions perception	van der Wurff (2011)	The user' perception of how many times he reads or hears in the media: differing opinions about a certain subject or (2) differing opinions that differ from his own	van der Wurff (2011)	e.g. Never; Very often
Order	Humanes et al. (2013)	What is the order of appearance within the news medium?	n/a	n/a
Outlet variety	Dubois and Blank (2018); van der Wurff (2011)	The number of news media outlets in a person's repertoire – online and offline: how many titles does a user read/watch/listen in a specific period of time?	Dubois and Blank (2018)	n/a

Appendix 3. Description of all diversity dimensions used in literature (in alphabetic order) (continued)

Diversity dimension	Authors	Description	Source	Category examples
Overall story tone	Day and Golan (2005); Humanes et al. (2013); S. Rodgers et al. (2000)	Whether the article was negative, neutral or positive towards the issue it discussed: what's the sentiment towards the issue?	Day & Golan (2005)	e.g. Positive; Neutral; Negative
Ownership	Shumow and Vigon (2016)	Who is the owner of the content?	n/a	e.g. ImpreMedia; Tribune; Univision
Party	van Hoof et al. (2014); Takens et al. (2010); Nord (2013); R. Rodgers et al. (2004): S. Rodgers et al. (2000)	The number of political parties across a medium distributes its attention – either implicit (topics) or explicit (party name): how is attention to political parties distributed?	Takens et al. (2010)	e.g. Coalition parties; New parties; Opposition parties
Political issue	van Hoof et al. (2014); Takens et al. (2010)	How many cleavages do an outlet include when discussing political issues?	van Hoof et al. (2014)	e.g. Left - right; National - global, Progressive – conservative;
Production source	Carroll et al. (1997); McCombs (1987)	The technical categories providing the video origination and distribution of the story	Carroll et al. (1997)	e.g. e.g. ENG; Station SNG; network SNG
Public agenda	Peter & De Vreese (2003)	The number of issues a particular social unit considered salient: what's the most important problem? The semantic variety of issues on the agenda of particular social unit: how many different categories are considered as the most important problem?	Peter & De Vreese (2003)	e.g. Jobs/ unemployment; Welfare; Money
Religion	Abdulla (2017)	What is the religion of the actor(s) involved?	n/a	e.g. Muslim; Christian; Bahai's
Section	McCombs (1987); Nestvold (1973); S. Rodgers et al. (2000)	A distinct part or subdivision of a writing (in dutch: 'katern') – news classification devoted by the outlets: which sections do the medium include?	n/a	e.g. News of the Day; Sports; Business
Source proximity	Voakes et al. (1996)	How near is the source from the subject - in terms of space?	n/a	e.g. Local; Nonlocal
Source status	Voakes et al. (1996)	The position of a source in relation to others with regards to its social or professional standing: at which level (in hierarchy) do the source work?	n/a	e.g. Executive; Middle Management; Worker
Source type	Voakes et al. (1996)	To which sector belongs the source?	n/a	e.g. Government; Private sector; Affiliated
Story uniqueness	Davie and Lee (1993); Carroll et al. (1997) Shumow and Vigon (2016)	Stories that exist as the only one	n/a	n/a
Story consonance	Alexander and Cunningham (2004); Bae (2000);	Stories that exist as duplicates	n/a	n/a
Summary position	Humanes et al. (2013)	The content place occupied in a summary: is the item included in the summaries and if yes, what's the position in the summaries?	n/a	unknown

Appendix 3. Description of all diversity dimensions used in literature (in alphabetic order) (continued)

Diversity dimension	Authors	Description	Source	Category examples
Topic	Humprecht and Buchel (2013); Carpenter (2010); Bae (2000); Carroll et al. (1997); Voakes et al. (1996); Day and Golan (2005); Nord (2013); Humanes et al. (2013); Abdulla (2017); Lee (2007); R. Rodgers et al. (2004); McCombs (1987); Powers and Benson (2014)	The primary subject of the content at a general level: this content concerns which domain?	n/a	e.g. Tax policies; General politics; Arab spring
Viewpoint	Voakes et al. (1996); Humanes et al. (2013); Masini and Van Aelst (2017); Pritchard (2001)	The subject of the content at a lower level: this content concerns which point of view?	n/a	e.g. Carnage-pro; Taverns
Writer	Day and Golan (2005)	What is the affiliation or occupation of the author?	Day and Golan (2005)	e.g. Academic; Advocates; Politicians; Religious figure

Appendix 4. Categorization of various diversity dimensions within literature (in alphabetic order)

Author	Author's diversity dimensions	Category
Abdulla (2017)	Gender	Gender
	Religion	Religion
	Ethnicity	Ethnicity
	Theme	Topic
	Geographic	Geography
	Story type*	Journalistic genre
	Story size*	Length
	Objectivity*	Objectivity
	Fairness and balance*	Balance
Alexander and Cunningham (2004)	Story uniqueness	Story uniqueness
Bae (2000)	Story topic	Topic
	Geographic	Geography
	Uniqueness	Story uniqueness
McCombs (1987)	Product	Section
	Item	Topic
	Geography	Geography
	Production source	Production source
Carpenter (2010)	Primary topic	Topic
	Hyperlink use	Hyperlink
	Attributes of stories	Attributes
Carroll et al. (1997)	Intermarket story consonance	Story consonance
	Story topic*	Topic
	Geographic origin of the story*	Geography
	Story source*	Production source
	Story length*	Length
	Market size*	Market size
Davie and Lee (1993)	Story consonance	Story consonance
Day and Golan (2005)	Issue	Topic
	Opinion: issue impact	Issue impact
	Opinion: affective	Overall story tone
	Criticism individual	Criticism individual
	Criticism organization	Criticism organization
	Issue outcome	Issue outcome
	Newspaper*	Newspaper
	Type*	Authorship
	Writer*	Writer
Dubois and Blank (2018)	Media repertoire	Outlet variety
Humanes et al. (2013)	Perspective	Viewpoint
	Theme*	Topic
	Journalistic style*	Journalistic genre
	Importance: length*	Length
	Importance: summary position*	Summary position
	Importance: order*	Order
	Assessment*	Overall story tone
van Hoof et al. (2014)	Party	Party
	Political issue	Political issue
Humprecht and Buchel (2013)	Actor	Actor
	Topic	Topic
Kim and Kwak (2017)	Antagonistic viewpoint	Antagonistic viewpoint
Lee (2007)	Subject	Topic

Note: diversity dimensions marked with an asterisk are indicated to have a limited methodological description from which it was difficult to deduce their relation with the concept of news diversity.

Appendix 4. Categorization of all diversity dimensions used in literature (in alphabetic order) (continued)

Author	Author's diversity dimensions	Category
Masini and Van Aelst (2017)	Actor	Actor
	Viewpoint	Viewpoint
Nestvold (1973)	Amount	Length
	Type	Section
Nord (2013)	Issue	Topic
	Actor	Actor
	Political	Party
Peter & De Vreese (2003)	Public agenda	Public agenda
Powers and Benson (2014)	Journalistic genre	Journalistic genre
	Authorship	Authorship
	Topical foci	Topic
Pritchard (2001)	Viewpoint	Viewpoint
R. Rodgers et al. (2004)	Geographical preference	Geography
	Controversial	Controversial
	Ideological	Party
	Subject	Topic
S. Rodgers et al. (2000)	Gender	Gender
	Ethnicity	Ethnicity
	Age	Age
	Role	Actor
	Section	Section
	Overall story tone	Overall story tone
	Political ideology	Party
	Balance	Balance
	Conflict	Conflict
	Blame	Blame
Shumow and Vigon (2016)	Content duplication	Story consonance
	Ownership*	Ownership
Takens et al. (2010)	Party	Party
	Issue	Political issue
Voakes et al. (1996)	Frame	Topic
	Subframe	Viewpoint
	Idea element	Idea element
	Source type	Source type
	Source status	Source status
	Source proximity	Source proximity
van der Wurff (2011)	Outlet variety	Outlet variety
	Diversity as received	Opinions perception

Note: diversity dimensions marked with an asterisk are indicated to have a limited methodological description from which it was difficult to deduce their relation with the concept of news diversity.