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Abstract

Normative theorists of the public sphere, such as Jürgen Habermas, have been very critical of the 'old' mass media, which were seen as unable to promote free and plural societal communication. The advent of the internet, in contrast, gave rise to hopes that it would make previously marginalized actors and arguments more visible to a broader public. To assess these claims, this article compares the internet and mass media communication. It distinguishes three levels of both the offline and the online public sphere, which differ in their structural prerequisites, in their openness for participation and in their influence on the wider society. Using this model, the article compares the levels that are most strongly structured and most influential for the wider society: the mass media and communication as organized by search engines. Using human genome research and analysing Germany and the USA, the study looks at which actors, evaluations and frames are present in the print mass media and on websites, and finds that internet communication does not differ significantly from the offline debate in the print media.

Keywords

biotechnology, civil society, content analysis, internet, print media, public sphere, search engines

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Conceptual Framework

The public sphere is critically important for modern societies. It serves as a forum in which to communicate collectively relevant issues, and allows citizens to inform themselves about societal developments and to observe and control political, economic and other elites. Because of its substantial role, many scholars have formulated normative theories which describe how the public sphere should be structured in order to ideally fulfil this role.

The most prominent such normative theory is certainly the 'participatory' (or 'discursive') model, with Jürgen Habermas as its strongest advocate (e.g. Habermas, 1989, 1992, 1998; cf. Calhoun, 1992). Quite similar views have been expressed by Benjamin Barber (1984, 1996), Peter Dahlgren (1991), Paul Hirst (1994), Amitai Etzioni (1997) and others. According to this model, public communication should include a wide range of relevant topics, evaluations and arguments and should strive for the 'widest possible empowerment', i.e. extensive 'popular inclusion' of different actors (Ferree et al., 2002a: 296ff.). Representatives of civil society are particularly important – Habermas (e.g. 1998) considers them especially autonomous (*autochthon*) as they are involved in 'small, non-bureaucratically organized grassroots associations', therefore 'free from the burden of making decisions and from the constraints of organizational maintenance' and 'closer to personal, everyday experience' (Ferree et al., 2002a: 300ff.). Therefore, they ought to play a 'special role in the public sphere and their inclusion is vital' (Ferree et al., 2002a: 301).

These normative demands are formulated to apply to the public sphere as a whole; however, they can be realized to different extents in different fora within the public sphere. Gerhards and Neidhardt (1993) distinguish three kinds of fora within the public sphere, which can be sorted hierarchically according to (1) the elaboration of their organizational structure, (2) their openness, i.e. the degree to which they allow citizens to participate, and (3) their societal impact.

The first forum, the 'encounter public sphere', consists of everyday, face-to-face communication between citizens. This type of communication takes place on streets, in parks, pubs, etc., it has no fixed organizational structure, and gives citizens ample opportunity to discuss very diverse issues. Its impact on society remains rather weak, and the number of people reached is relatively small. The second forum are 'public events', including town hall meetings, public lectures, or protest rallies. They have at least a minimal organizational structure, and specialists and opinion leaders participate in this forum and may structure and dominate communication. Public events have more impact on society and reach more people than do 'encounter public sphere'-type communications. The mass media constitute the third forum in the public sphere. They possess full-fledged technical and organizational infrastructure and are dominated by specialists like journalists, experts and collective actors, whereas ordinary citizens are usually relegated to the (passive) role of receiving. In turn, the mass media have a significant impact on society because this forum reaches a large audience and organizes substantial parts of societal self-observation and opinion formation (cf. Ferree et al., 2002b: 10). Yet this comes with noticeable restraints: when events are presented, the mass media drastically reduce social complexity – only a fraction of all available topics, actors and arguments can get published. This is a major shortcoming in light of the ambitious demands of the participatory model of the

public sphere, especially because the selection modes of the media, such as newspaper or television, are seen to be biased by economic pressures and political preferences. As a result, the media are perceived as a strongly regulated forum of communication (cf. Habermas, 1998) which systematically privileges powerful and institutionalized actors, excludes smaller institutions and civil society and essentially circumvents public debate.

Against this backdrop, a substantial change in the media landscape is greatly important. Alongside the often criticized 'old' media such as newspapers, radio and television, the internet has become a 'new', significant medium. It is becoming ever more accessible to more people, is used more often, increasingly considered as a legitimate information source and is, in part, superseding the old mass media in these respects (e.g. von Eimeren et al., 2004). Many political scientists, media researchers and other scholars, as well as political activists, believe that this new medium has the potential to fundamentally change societal communication and that, in a nutshell, internet communication makes a better public sphere than have the old mass media (for summaries, see Jankowski and van Selm, 2000; Rucht et al., 2008; van de Donk et al., 2004; van Os et al., 2007). These hopes draw heavily on the participatory model's understanding of 'good' public debates (e.g. Negroponte, 1995; Rheingold, 1992). One expectation is that internet communication might include multiple actors, especially those from civil society who, with comparatively few resources, may not have had (as much) access to the old media. Furthermore, it is expected that alternative evaluations and interpretations will be presented online, and that the information available will be more differentiated on the internet. In the long run, the internet might democratize the public sphere and lead to strengthened political interest and participation among citizens (see Dahlgren, 2005; Sarcinelli, 1997).¹

These hopes are based on the fact that the structure of internet communication is fundamentally different from that of the old media – one in which gatekeeping journalists and mass media institutions seem to play a less important role. Hence, senders may find it easier to present themselves and their issues online. Actors with fewer resources, such as small NGOs or individual citizens, may be able to present information online in a way that is significantly more cost-effective than getting into television, radio or print media (van Os et al., 2007). A PC and an internet connection are the only technical requirements, do not cost much to acquire and are, for many, already available at home.

When looking at these expectations, the question is whether internet communication is indeed 'better' – when seen from the point of view of participatory theory – than communication in the old media. This question, although generally empirically accessible, has not yet been analysed sufficiently. Apart from theoretical debates about the internet's status as part of the public sphere (e.g. Oblak, 2002; Papacharissi, 2002), empirical research on the internet has thus far concentrated on user behaviour (e.g. Coleman et al., 2008; Klimmt et al., 2005), or on the 'digital divide' between different user groups and different world regions (e.g. Althaus and Tewksbury, 2000; Rodino-Colocino, 2006; Newholm et al., 2008). Content analyses have scrutinized the online representations of political institutions (e.g. Bieber, 2001), unions (e.g. Ward and Lusoli, 2003) and mass media institutions (e.g. Salaverria, 2005), or analysed communication in online discussion boards (e.g. Jankowski and van Os, 2004) or in chat rooms (e.g. Fung, 2002).

Table 1. Traditional and internet-based fora of the public sphere

| Traditional public sphere | Internet-based public sphere | Organizational prerequisites | Openness for participation | Impact on society |
|---------------------------|--------------------------------|------------------------------|----------------------------|-------------------|
| Encounters | Email, messaging, etc. | Low | High | Low |
| Public events | Discussion boards, blogs, etc. | Middle | Middle | Middle |
| Mass media | Search engines | High | Low | High |

However, systematic comparison is necessary to answer the question of whether internet communication is indeed better than the old media, because the basic hopes regarding the internet are always relative: namely, that the internet provides *greater* accessibility for actors who do not receive attention in other media, and that perspectives underrepresented in other formats are *more strongly* represented in the internet. We therefore compare the old and new media. In doing so, we believe that we have to distinguish between different fora of the internet, as we did for the 'traditional' offline public sphere (cf. Zimmermann, 2006: 16ff.). In our view, the structure of the internet mirrors that of the public sphere in that several levels can be distinguished that differ in the extent of organizational structure, the level of participation and the impact they have on society. The online counterpart of the traditional 'encounter public sphere' is internet-based interpersonal communication such as emailing or instant messaging. The organizational prerequisites to keep this forum going are rather low, and the opportunities for participants to make themselves heard are high, but the impact on the larger societal debate remains low due to the small amount of people reached. Internet fora, discussion boards and blogs constitute the second level of the internet public sphere (although some of them, due to very small readership, may actually come close to interpersonal communication) Here, the structural prerequisites are a bit more sophisticated: these fora usually concentrate on certain topics and the selectivity for each participant to get his or her voice heard is somewhat higher than the first level; the amount of people who can be reached increases, as does societal impact. Finally, the mass media, which have a developed infrastructure and the greatest impact, are mirrored online by large, content organizing portals such as search engines. Table 1 summarizes the different forums of the traditional and the internet-based public sphere.

When comparing internet communication with the print media as one such 'old' medium,² one has to take these levels of offline and online publics into account: one cannot compare mass-oriented print media with blogs or discussion boards, as they are situated on different structural levels. Accordingly, we compare fora of mass media and internet communication that we consider to be on the same organizational levels, equally open for participation and having the highest impact on society: we analyse leading quality print media compared to internet search engines.

In doing so, we concentrate on a specific topic and two countries in order to reduce the analytic complexity. We aimed to choose a topic for analysis that was present in both

the old and new media, and of intense interest to civil society to ensure that multiple actors took part in the discussion. Human genome research, sequencing of the human DNA,³ met these criteria. It has been discussed intensively in recent years in several countries and also by many NGOs who have an interest in human genome research due to its ethical, social and legal implications, and its enormous costs (e.g. Center for Genetics and Society, 2005; Gen-ethisches Netzwerk, 1995; Greenpeace, 2004). Moreover, we analysed the two countries which exhibited the most heated debates: Germany and the USA (Gerhards and Schäfer, 2006). Apart from giving our analysis a broader foundation and thus making it more valid, such a comparison enables us to test whether a country like the USA, which has more widespread internet access and usage than Germany (Internet World Stats, 2006) and a stronger and more heterogeneous civil society (e.g. Curtis et al., 2001), shows evidence of more participatory internet communication.

Thus, we compare internet and print media communication on human genome research in Germany and the USA, and test whether we find 'better' communication in the internet. According to the participatory model of the public sphere, communication will be considered 'better' when multiple actors, plural evaluations and plural arguments are included.

Data and Methods

For our analysis we chose German and US print media and internet sources that are considered to be highly influential. For print media, we focused on leading quality broadsheets; these are read by elite groups and journalists, thereby influencing decision-making processes and providing topics for other media (cf. Wilke, 1999). We chose the *Süddeutsche Zeitung*, the *Frankfurter Allgemeine*, *The Washington Post* and *The New York Times*, which are the national quality dailies with the largest circulation in the two respective countries. For the time period from 1999 to 2001 – in which coverage on human genome research peaked worldwide (Gerhards and Schäfer, 2006) – we searched every section of these newspapers' CD-ROM or online archives for one of several key words, and thereby selected some 1900 articles for analysis.⁴

On the internet, we used the same key words in the most widely used search engines in the two countries: for Germany, these are google.de, yahoo.de and fireball.de; for the USA, these are google.com, yahoo.com and msn.com (cf. Pew Internet, 2006). Furthermore, as internet users orient themselves along the given ranking of search results, and tend to click more often on the results listed on the first pages (e.g. Machill et al., 2008: 602ff.), we only included the top 30 results from each search engine in our analysis. Our preliminary sampling resulted therefore in 180 links extracted from six search engines. After taking out 'dead links', we selected a final sample of 144 websites.

We coded the articles from the broadsheets and the internet pages linked from the search engines using content analysis.⁵ To assess the claims of the participatory model of the public sphere, we coded the variety of speakers and all evaluations and interpretations expressed on human genome research.⁶

Comparing Online and Print Media Communication

Our results illustrate the extent to which multiple actors, plural evaluations and diverse interpretations of human genome research are represented in the newspapers and websites analysed. For each of these dimensions, both countries' results for internet and print media are shown together, as the results are rather similar for both (Gerhards and Schäfer, 2006); however, differences between German and US web pages are highlighted.

Popular inclusion? Actors in the internet and print media

To assess whether a wide variety of actors, particularly many civil society actors, have a visible presence in print media and in internet communication, we measured the degree of different actors' participation in public communication by using the relative frequency with which they appeared in the print media and websites ('standing'). We grouped all actors from the 1900 newspaper articles and 144 websites into 19 groups; Table 2 shows the frequency of participation among the different groups.

For this dimension, the results indicate that internet communication is not more equal than communication in print media: we do not see a more extensive popular inclusion of societal actors, especially civil societal actors, on the web pages. In the internet, a small number of actors claim the bulk of standing for themselves, and, in this regard, communication online is even more one-sided than in the print media. Scientists, especially bio- and natural scientists, i.e. the primary experts on the topic, account for a large percentage of all actors, and this is even more so on the internet. This dominance is exerted by very few scientists: the individual actor appearing most often is Craig Venter, the chief scientific officer of the sequencing company Celera Genomics; he alone claims 5 and 9 percent of German and US standing, respectively. Other visible scientists are Francis Collins, who headed Celera's main competitor, the state-funded Human Genome Project, and biology Nobel laureate James D. Watson.

Beyond natural scientists, a particularly strong inclusion of other actors in internet communication is not evident. Only external journalists (i.e. journalists from mass media sources other than those included in our analysis) are more strongly represented in the internet. All other groups are less well represented on the web pages analysed. This holds true for social scientists, those from the arts and humanities, science administrators, as well as for representatives from institutionalized politics. Of course, actors such as economist Jeremy Rifkin, representatives of biotech companies, or US presidents Clinton and Bush and German chancellor Schröder appear from time to time in both media, but significantly less often in the internet. Most notably, this pattern is also true for civil societal actors such as church and NGO representatives, disability groups, artists, individual citizens and so on. They appear less often in the internet than in the newspapers analysed. As a more technical measure, we calculated the Herfindahl index, which measures the degree of concentration of nominal variables.⁷ This confirmed that the concentration of communication by a few actors in the internet exceeds that in the print media.

These findings are true for both countries; however, it is noteworthy that US internet communication is even more one-sided than its German equivalent. Bio- and natural scientists account for almost three-quarters of all actors on US web pages; in Germany,

Table 2. Actors in the internet and print media (in %)

| | Print media | Web | US web | German web |
|--|-------------|-------------|-------------|-------------|
| Scientific actors | 55.3 | 59.6 | 81.5 | 49.3 |
| Bio-/natural scientists | 43.9 | 54.2 | 72.4 | 46.0 |
| Social sciences/arts and humanities | 7.0 | 2.1 | 0.0 | 3.3 |
| Scientific administration | 2.1 | 2.9 | 8.0 | 0.0 |
| Other scientists and academics | 2.3 | 0.4 | 1.1 | 0.0 |
| Economic actors | 15.3 | 3.8 | 2.3 | 4.7 |
| Biotechnical/pharmaceutical companies | 10.9 | 2.1 | 2.3 | 2.0 |
| Stockbrokers/fund managers | 3.0 | 1.3 | 0.0 | 2.0 |
| Other economic | 1.4 | 0.4 | 0.0 | 0.7 |
| Centre of politics | 14.0 | 8.8 | 3.4 | 12.0 |
| Executive (government, ministries) | 7.9 | 3.8 | 1.1 | 5.3 |
| Legislative | 1.1 | – | 0.0 | 0.0 |
| Judiciary | 1.2 | – | 0.0 | 0.0 |
| Parties | 0.6 | 0.4 | 0.0 | 0.7 |
| Other politicians | 3.1 | 4.6 | 2.3 | 6.0 |
| Periphery of politics: civil society | 5.1 | 3.8 | 2.3 | 3.3 |
| Church | 0.7 | – | 0.0 | 0.0 |
| Social movements/NGOs | 0.7 | 0.4 | 0.0 | 0.7 |
| Patient/disabled/charity organizations | 0.5 | 0.8 | 0.0 | 1.3 |
| Artists | 2.1 | – | 0.0 | 0.0 |
| Other civil society | 1.1 | 2.5 | 2.3 | 1.3 |
| External journalists | 6.3 | 21.5 | 9.2 | 28.7 |
| Various | 3.8 | 1.7 | 1.1 | 2.0 |
| Readers | 3.6 | – | 0.0 | 0.0 |
| Other actors | 0.2 | 1.7 | 1.1 | 2.0 |
| Herfindahl index of concentration | 0.225 | 0.346 | 0.541 | 0.303 |
| <i>N</i> | 1610 | 237 | 87 | 150 |

Table 3. Evaluations in the internet and print media (in %)

| | Print media | Web | US web | German web |
|-------------------------------------|-------------|-------------|-------------|-------------|
| Neutral statements (no evaluation) | 40.4 | 56.7 | 71.3 | 48.4 |
| Statements expressing an evaluation | 59.6 | 43.3 | 28.7 | 51.6 |
| Of those: positive | 61.5 | 67.3 | 96.0 | 58.2 |
| Of those: ambivalent | 25.6 | 16.7 | 4.0 | 20.3 |
| Of those: negative | 12.9 | 16.3 | 0.0 | 21.5 |
| Herfindahl index of concentration | 0.460 | 0.507 | 0.923 | 0.426 |
| N | 1610 | 240 | 87 | 150 |

they account for barely one-half. All other actor groups – business, political and civil societal actors as well as external journalists – are more strongly represented on German websites.

Plural positioning? Evaluations of human genome research

Beyond the representation of actors, the content of communication, such as the evaluation of a given topic, is of interest. Actors can affirmatively support a topic, reject it, or adopt an ambivalent or neutral position. In public communication, actors usually strive to establish their evaluation of a certain topic because if they succeed, their preferred modes of action will be privileged. The participatory model of public communication rejects such dominance and demands a plural positioning in which many different voices, especially the marginalized and repressed, can express themselves. Were internet communication better than print media, we would expect representation from multiple, differentiated and fringe opinions.

Table 3 shows that internet sources in both countries contain fewer texts with any sort of evaluation at all than do print media sources; neutral texts (with no evaluation) are the most common type of article on the internet. When looking only at those statements that express an evaluation, we see that plural evaluation towards human genome research is absent from both the print media and the internet. Instead, positive evaluations clearly dominate. The sequencing of human DNA is widely seen as one of the great discoveries in scientific history, and evaluations tend to emphasize its potential for the development of genetically based diagnostics and therapeutics. In sum, we observe a ‘bias toward the legitimacy of science’ (Smart, 2003: 24) in both media, and as shown by the Herfindahl index, an even slightly stronger positive bias on the internet.

The generally positive tone towards human genome research is in part a byproduct of the strong representation of bio- and natural scientists in both media and also of the fact that they overproportionally promote such research. Social scientists, humanities scholars and civil societal actors are those that usually take the most negative stance – with examples such as Greenpeace (2004) criticizing Celera Genomics for ‘patenting life’ and

the German NGO Gen-ethisches Netzwerk (1995) fearing that based on the research, employers and health insurances might start discriminating against people with genetic profiles that include risks for specific illnesses. But, as shown earlier, these actors are only marginally present, which affects the distribution of evaluations and leads to a hegemony of positive evaluations both on the internet and in the print media.

This is largely true for both Germany and the USA; however, US internet communication is again more one-sided. Among the relatively few evaluating statements in the USA, almost all were positive (the Herfindahl index shows an almost maximum level of concentration). In contrast, German websites, while also largely affirmative, show a higher amount of ambivalent and critical statements.

Plural framing? Interpretations of human genome research

Apart from evaluating an issue, actors also interpret it in specific ways, using ‘frames’ (e.g. Benford and Snow, 2000; Entman, 1993) that determine the important aspects and appropriate perspectives for viewing an issue. Frames can influence whether an issue is defined as a problem issue, and, if so, which solutions are applicable. Framing can also be limiting by excluding certain views: if actors frame an issue successfully, they are able to set the limits of what is discursively possible and narrow down the possible options for action. In contrast, the participatory model of the public sphere emphasizes that communication should be open and include heterogeneous frames.

Using qualitative frame analysis in a preliminary study, we distinguished four general frames used to interpret human genome research, each consisting of various subframes:⁸ a political, an economic, a scientific and a socio-ethical frame (for more details see Gerhards and Schäfer, 2006).

Scientific-medical frame. This frame encompasses the conditions of and restrictions on scientific work, progress and results. Six subframes can be distinguished:

- 1 *Scientific progress:* This includes all interpretations that view human genome research as a scientific (‘as important as landing on the moon’) and/or historical achievement (‘great day in the history of mankind’), and/or discuss the significance of developed methods and human DNA sequencing for biology (‘the holy grail of biology’). Interpretations subsumed here tend to be positive, even enthusiastic towards the research.
- 2 *Medical progress:* This subframe refers to the interpretation of human genome research from a medical point of view. Points of interest include whether certain illnesses are genetic in origin and which possible diagnoses and therapies are feasible. For example, arguments in this frame mention the research’s potential to help ‘eradicate diseases’, particularly cancer, and to develop ‘tailor-made’ treatments to address specific genetic profiles.
- 3 *Freedom of scientific research:* This includes questions related to the normative foundations of science, namely freedom of research. This subframe is often used to contrast demands or attempts to regulate science, and people here tend to argue that the scientific community has every right to choose its own research topics.

- 4 *General accessibility of scientific knowledge:* In this category, we include all questions relating to the accessibility of discoveries. In this case, arguments asked whether the human genome sequence should be published free of charge and 'available for all', as planned by the Human Genome Project, or if it could be patented and licensed for commercial use, which was Celera Genomics' business plan. In this subframe, Celera's plan was discredited as 'selling genes' and as a 'commercialization of life'.
- 5 *Research funding:* This refers to the financial and infrastructural promotion of human genome research. The main questions were the enormous costs, initially estimated at US\$3 billion, whether sequencing the genome was worth that amount of money and, if so, who should pay for it. One feature of the US debate was whether taxpayers should fund the research (via the Human Genome Project) or whether it should be funded through companies such as Celera.
- 6 *Self-regulation of science:* Finally, questions relating to the internal regulation and control of science, such as 'peer review', ombudsmen or controlling panels, make up this subframe.

Economic frame. Here, we have summarized interpretation patterns that position human genome research in an economic framework, consisting of two subframes:

- 1 *Business management effects:* This subframe refers to the economic consequences of the research for individual companies, their profitability and their stock developments. This subframe argues that genetic research is a great business opportunity for future companies boosting their stocks, yet also contains arguments that question business plans and interpret the overall development of the biotech sector as a 'bubble' which is bound to burst.
- 2 *Economic effects:* This category contains arguments about the macroeconomic effects of human genome research, such as the research's ability to strengthen the German or US national economy, to help set up new companies and create jobs. This was relevant particularly in economically troubled Germany, where human genome research was interpreted by some as a future 'key technology' in which the country should participate in order to boost its economy.

Political frame. This third group brings together political patterns of interpretation. Regulatory and participatory dimensions correspond to the input and output sides of the political system:

- 1 *Political regulation:* This aspect refers to whether human genome research requires regulation in political and judicial systems. This regulation – via laws or court decisions – are demanded against the potential patenting of genetic information ('patenting of life') and against a possible discrimination of people with genetically determinable risks (referred to as 'two-class medicine').
- 2 *Society's participation in regulation:* This subframe refers to the possible need for citizens to participate in decision-making about human genome research (in

consensus conferences, referenda, etc.), both in terms of whether participation exists and also as to whether it is considered a good idea.

Socio-ethical frame. The fourth group consists of ethical and social patterns of interpretation:

- 1 *Concept of humankind:* Here, discussion centres around the question whether and to what extent humankind is determined by genetic and/or social factors. Human genome research is seen to establish a 'genetic reductionist' way of thinking that reduces individuals to their genetic characteristics and neglects social influences.
- 2 *Discrimination:* Discussions about the research's potential to fuel genetically based discrimination by insurance companies, employers, etc. fall under this subframe. Examples are often given in the form of individual scenarios: 'What will health insurances do when they know that a person has a 50 percent chance of getting cancer in the next 20 years?'
- 3 *Property rights and patenting:* This category consists of property and usage rights connected to genetic information. The main issue is whether genetic information should be regarded as generally ownable and, if so, if it should by default be public property or whether it could be owned by companies.
- 4 *General ethical and moral questions* are also part of the socio-ethical frame.

While these frames and subframes are interesting in and of themselves and could be laid out in more detail (see Gerhards and Schäfer, 2006), our main focus here is on how they are used in internet and print media communication. More specifically, we look to see if the internet proves to be a better form of communication along the line of the participatory model, as would be evidenced through a more heterogeneous framing.

Again, as Table 4 indicates, internet communication is not more heterogeneous in terms of framing, although this dimension differs from actors and evaluations. For the first two dimensions, internet communication was even more one-sided than print media, being dominated by scientists and affirmative evaluations. It is noteworthy, however, that the differences between internet and newspaper communication are less strong in the framing dimension (the Herfindahl index, calculated at subframe level, does not show substantial variation).

Looking at the results in more detail, it is noteworthy that scientific and medical patterns of interpretation are by far the most common, with the medical progress subframe playing a particularly important role. This is true for both media, although scientific-medical interpretations are, again, more strongly represented in the internet. In addition, there are several smaller differences between the two media, such as a stronger presence of the socio-ethical frame in the print media. The distribution of the political and economic frames also shows some subtle variations.

Internet sites and newspapers show a similar degree of heterogeneous framing, and this is also true for both German and US internet pages. The Herfindahl index shows that the specific make-up of framing in both countries is similar. The scientific-medical frame dominates to a very high degree, accounting for almost three-quarters of all arguments. Medical patterns of interpretation play a particularly large

Table 4. Framing in the internet and print media (in %)

| | Print media | Web | US web | German web |
|--|-------------|-------------|-------------|-------------|
| Scientific-medical frame | 61.2 | 71.4 | 71.1 | 71.6 |
| Scientific progress | 16.4 | 19.6 | 10.9 | 24.1 |
| Medical progress | 32.9 | 30.6 | 33.2 | 29.4 |
| Freedom of research | 2.2 | 1.2 | 0.5 | 1.6 |
| Accessibility of scientific knowledge | 5.9 | 12.7 | 16.6 | 10.8 |
| Research funding | 3.1 | 3.1 | 1.6 | 3.9 |
| Self-regulation of science | 1.0 | 4.0 | 8.3 | 1.8 |
| Economic frame | 8.2 | 6.9 | 4.1 | 8.4 |
| Business management effects | 5.9 | 4.0 | 3.1 | 4.5 |
| Economic effects | 1.9 | 2.9 | 1.0 | 3.9 |
| Political frame | 8.0 | 10.5 | 17.6 | 6.9 |
| Political regulation of genomics | 4.2 | 7.1 | 12.4 | 4.5 |
| Participation of society in regulation | 3.8 | 3.3 | 5.2 | 2.4 |
| Socio-ethical frame | 22.7 | 11.2 | 7.3 | 13.2 |
| Concept of humankind | 7.3 | 2.8 | 0.0 | 4.2 |
| Discrimination | 4.6 | 2.6 | 3.1 | 2.4 |
| Property rights and patenting | 6.4 | 3.9 | 2.6 | 4.5 |
| General ethical and moral questions | 4.5 | 1.9 | 1.6 | 2.1 |
| Herfindahl index of concentration | 0.161 | 0.163 | 0.178 | 0.169 |
| N | 2609 | 574 | 193 | 381 |

role, with all other frames clearly subordinate. There are, however, smaller country differences. Economic and socio-ethical interpretations play a somewhat more important role on German websites, whereas political interpretations are more common on US sites.

In sum, these results suggest that the expectation for the internet to be a more diverse medium is not fulfilled in the framing dimension. In fact, there are hardly any differences between the internet and traditional print media.

Summary and Discussion

The emergence of the internet gave rise to many expectations about a potential reconfiguration of public debates and, more specifically, for a shift towards the idealized participatory

model of the public sphere. Considering that the internet is an easily accessible medium with low entry barriers, many observers hoped that internet communication would have participatory effects, such as granting actors with few resources, like those in civil society, easier access to the public sphere than old media such as newspapers. Observers also hoped that internet communication would lead to more inclusive public debates with diverse evaluations and arguments.

We evaluated these expectations empirically in this article. First, we laid out models of the traditional and the internet-based public spheres, aiming to identify the appropriate types of comparison between the two. Focusing on the debate surrounding human genome research, we analysed whether internet communication is 'better' than print media communication in the sense that it better corresponds to the demands of the participatory model. In doing so, we analysed which actors received most attention and which evaluations and arguments were expressed in both media.

In our study, we found only minimal evidence to support the idea that the internet is a better communication space as compared to print media. In both media, communication is dominated by (bio- and natural) scientific actors; popular inclusion does not occur. Evaluations are largely one-sided and affirmative towards human genome research in both the print media and internet. The interpretations are not heterogeneous; rather, the scientific-medical frame dominates. Particularly relevant for our question is that internet communication seemed even more one-sided and less inclusive than print media communication in terms of its actor structure and issue evaluations. In terms of arguments, there is no difference between the two media. This is true for both Germany and the USA, with internet communication in the USA being even more one-sided than in Germany.

These results are in line with several other current studies which compare 'old' media with communication structured by search engines. For example, an analysis by Dieter Rucht et al. (2008) compared internet communication and print media coverage on genetically modified food. They concluded that differences between internet and print media are much weaker than the theoretical literature would suggest. Ann Zimmermann, analysing several political topics in an international comparison, came to similar results: 'In a space constructed by search engines, the way in which attention is directed in online communication is almost as hierarchically structured as it is for newspapers: Civil societal actors are systematically discriminated against as compared to governmental actors', and therefore 'the online communication is not more democratic than traditional mass media' (Zimmermann, 2006).

Multiple studies on various political and scientific issues have come to the same conclusion, namely that public debate in the internet, as long as it is organized by search engines, advantages established actors, while making it more difficult for smaller actors and their arguments to appear in a relevant manner. One main reason is certainly the modes of selection that search engines apply: their gatekeeping, in contrast to the old mass media, relies mainly on technical characteristics of websites (e.g. Machill et al., 2008: 600). As a look at Google's search mechanism illustrates, selection is based on the interconnectedness of individual websites, summarized through the 'PageRank' algorithm: '[I]f a page was linked to many other pages, it was likely to be more important. Furthermore, if the pages that linked to a page were important, then that page was even more likely to be important' (*The Economist Technology Quarterly*, 2004: 32; see also

Page, 1998). This mechanism tends to favour large, institutionalized actors, who can link their websites with other, similarly important actors. Governmental ministries can, for example, construct linking networks with other ministries, which would increase their ranking on Google. And because building up such networks requires resources, institutions that are large, established and well financed tend to be the ones that benefit most from these search criteria. For civil societal actors, this is decidedly more difficult.

This is highly important because search engines are major crossroads in internet traffic, and if they lead users in certain directions, this will be evidenced by page views on big pages and non-views on smaller ones. This means that although a large variety of actors and standpoints can be found somewhere in the internet, and although NGO websites, blogs, discussion boards, etc. will provide practically every conceivable viewpoint on their respective website, it is unlikely that the average user will find this content. This is due to the fact that only the respective URL, not a search engine, would bring the user to an alternative page.

In this way, search engines might actually silence societal debate by giving more space to established actors and institutions, to experts and to expert evaluations and views, thereby replicating pre-existing power structures online. This manner of actor and content selection might be even inferior compared to the old (and already often criticized) mass media, because the latter at least employ journalistic norms like balanced reporting and neutrality when selecting actors and statements, and thereby present a possibly better communication than the internet.

As mentioned earlier, these results seem to hold true for several topics⁹ and in several western countries. Nevertheless, our theoretical model would still lead us to expect debate in other countries to be structured differently. In countries such as Germany and the USA, freedom of the press and freedom of opinion are widely guaranteed. Therefore, print media communication is relatively open and balanced (even though Habermas and other critics do refer to German and other western media as power-regulated). This may differ in more authoritarian countries, such as China, where both mass media and search engines are government controlled (cf. Search Engine Watch, 2006) and censored because their content is seen as potentially dangerous to the system (e.g. Kluver, 2005). In such countries, where pathways to the top (and most influential) levels of the offline and online public sphere are blocked, the other two levels provide a more open (although less effective) 'counter-public'. Accordingly, small and potentially illegal offline publications, as well as blogs, discussion boards, emails and the like become an important place for communication in these political environments (e.g. Zheng and Wu, 2005).

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Notes

1. In contrast, some authors, albeit not as many, have been more sceptical in judging the internet's potential. They fear that 'the internet could accelerate fragmentation of the public sphere, which may then be detrimental for the quality of democracy . . . ; that already dominant interest

groups and actors would take up the foreground in practical use of the internet; that the sheer wealth of available information would bring about a radical selection process (and thus, the use of selection tools, which also puts smaller actors at a disadvantage); . . . that internet discussion groups and information sources may not comply with the same quality standards that govern journalistic media; and that in the long run, the internet could take on an autocratic architecture' (Rucht et al., 2004: 9).

2. **Print media are particularly suited for empirical research, in that their content is usually available in electronic archives, easy to search and to acquire using key words, and because there is no prominent secondary communication level alongside the text (only a few pictures and no animation or sound). This allows for easier coding than television programmes, for example.**
3. Genome research generally refers to the analysis of complete genomes including the number and arrangement of genes as well as their sequence and function (Hucho and Köchy, 2003: 3). In this article, we restrict ourselves to human genome sequencing research. More information on genomics can be found in Cook-Deegan (1995).
4. Articles were selected if they contained any one of the words 'genome', 'Celera', or 'Venter', three key terms that proved to be valid and effective in a preliminary study. Celera Genomics is the name of a US company in competition with the international Human Genome Project to sequence the human DNA. J. Craig Venter was the chief scientific officer of this company. We also searched for several synonyms of these key terms to make the investigation as complete as possible and compared the results of our selection again to the newspapers' hard copies.
5. Content analysis, and especially frame analysis, is a rather complicated methodological design; a thorough discussion does not fall within the scope of this article (Gerhards and Schäfer, 2006; Schäfer, 2007). The code book used in the quantitative content analysis is available online (www.polsoz.fu-berlin.de/soziologie/arbeitsbereiche/makrosoziologie/projekte/diskurs/materialien/index.html).
6. In order to code these interpretations, we conducted a preliminary qualitative content analysis in which we reconstructed the basic patterns of human genome research framing. We analysed a heterogeneous corpus of texts drawn from different sources, and extracted a total 85 different 'idea elements', i.e. ideal-type arguments that were used to interpret human genome research, such as 'Human genome research enables the development of new diagnostic treatments'. The aim was to encompass the widest possible range of interpretations concerning our topic. Afterwards, in our quantitative content analysis, it was coded whether an actor expressed one or several of these idea elements. In total, there were 3200 incidences of the 85 idea elements in our sample.
7. This index is the most common measure for the degree of concentration of frequency data (cf. Kwoka, 1977). It can range from $1/N$ (N being the number of actor groups in a particular case) to 1: **the larger the value, the more concentrated the range of actors. A value of 1 indicates the highest degree of concentration, i.e. the total monopoly of one actor.** To calculate the Herfindahl index for the standing dimension, all aggregate categories such as 'scientific actors', 'economic actors', etc. except 'external journalists' (which is not an aggregate, but a single actor category) were excluded from the calculation.
8. The literature contains a number of different typologies concerning patterns of interpretation, some of which focus on biotechnology (e.g. Durant et al., 1998: 288; Kohring and Matthes, 2002; O'Mahony and Schäfer, 2005; Strydom, 1999). These pre-existing patterns of interpretation are on different levels of abstraction and were used to varying degrees as suggestions in our analysis.

9. One might also come to different results when topics are analysed that deviate from societally established moral consensus and codes of conduct. Taboo topics, such as homosexuality in some countries, certain sexual preferences, but also blasphemy, racism, etc., may indeed be communicated more freely in the internet, as this medium allows for anonymity and is less controllable.

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