A Model for Evaluating Risk Reporting

The Case of UMTS and Fine Particles

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ABSTRACT

■ The media's coverage of risk issues is often criticized for neglecting the scientific perspective on risk. This criticism, however, ignores the social context in which journalists operate: they have to report on people's worries about health-threatening issues and they have to cover actions taken by the government to address these worries. The media have to report on such issues, irrespective of the fact that in terms of scientific risk assessment the risk may be negligible. In this article, a new evaluation model for media coverage of risk is developed on the basis of a content analysis of two risk issues – universal mobile telecommunications system (UMTS) base stations and fine particle pollution (FPP) – and extensive consultation with prominent journalists, scientists and stakeholders in the Netherlands. The model defines criteria regarding sources, frames, amplification, risk perception, scientific data and the language used in the coverage. This approach offers a concrete starting point for the reporters who cover these issues in the daily news pages. ■

Key Words frames, journalism, media, risk, sources

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Introduction

Criticism of media coverage

The news media are often criticized for the way they handle risk and scientific topics. Indeed, they have been accused of being biased, inaccurate, sensational, simplistic and guilty of exaggeration of events and polarization of arguments (Allen, 2002; Dunwoody, 1992; Friedman et al., 1999; Gregory and Miller, 1998; Murray et al., 2002; Willis and Okunade, 1997). The amount of coverage the media dedicate to risks is inversely proportional to risk in terms of mortality rates or damage to society (Singer and Endreny, 1993). Most risk stories are not about risk itself, but about accusations, worries, actions and counteractions. Questions like 'what happened?', 'who is to blame?' and 'what is the government doing about it?' are more important for reporters than those that concern, for instance, whether exposure to electromagnetic fields might cause long-term health problems (Wiedemann et al., 2003). A conflict between actors may make an issue newsworthy, although the risk is negligible or even non-existent in scientific terms. Alarming content, extreme opinions and outrage seem to dominate the coverage of risk-related issues (Sandman, 1997). The critics argue that, because of the media, audiences are overestimating unfamiliar or novel risks, but underestimating familiar or everyday ones (Cohl, 1997; Glassner, 1999; Slovic, 2000). Instead of warning the audience about important risks, the media fabricate minor risk issues as being socially relevant. This obscures from the public other lifestyle risks (e.g. smoking, obesity) that are much more important.

The media are also criticized for using simple 'layperson frames' to report on risk that ignore expert opinion. From the experts' point of view, any risk needs to be scientifically established before any action can be taken. In contrast, the public might demand action when there is only a slight worry about the consequences of an exposure. This social perspective on risk is defined by outrage factors like uncertainty, involuntary exposure and lack of trust in official sources (Walter et al., 1995). The media's emphasis on this perspective intensifies the magnitude of the perceived risk (Wiedemann et al., 2003: 293).

In so doing, the media may trigger or reinforce a process described as the 'social amplification of risk' (see Kasperson et al., 1987; Petts et al., 2001; Pidgeon et al., 2003). Risk amplification refers to the chain of events in which a specific risk is magnified, resulting in various social, political and economic consequences (Sheehy et al., 2002). The media are often criticized for playing a leading role in this amplification process, for instance, by magnifying the human interest element of stories about

(alleged) victims, or by neglecting (or downplaying) scientific data on the risk.

The criticism criticized

For journalists, involved in the daily production of news, this kind of criticism of media coverage is quite problematic. It ignores the context in which they operate and it does not offer a useful starting point for changes in journalistic practice. The media operate in different 'modes' (Peters, 1994): sometimes they popularize scientific knowledge, but more often than not, they adopt the 'reporter mode', reporting events and transmitting top-down information from relevant social actors. Furthermore, the media operate in the 'arena mode', offering a platform for public communication among social actors. All this may result in news whereby the scientific perspective on risk does not play an important role. Alternatively, in terms of the expert's perspective, the result is news that exaggerates the risk.

A new model for evaluation

The question is this: how can we develop a model for evaluating risk coverage that takes into account the social context in which reporters operate? This model has to not only incorporate the different modes that the media operate in, but also the role of the media in the amplification process and the different frames used by experts and the public.

The consequence of this approach is that evaluation should not take place on the level of an individual article but of the coverage as a whole. One article might pay attention to the point of view of the officials, whereas another might be about the scientific approach or public concerns. However, what is important is the picture that emerges when the complete news wave on a topic is evaluated. Which sources or frames dominate the coverage as a whole? Who has the power to define the issues? Which language (possibly linked to a particular frame) is used to describe the issue? Looking at coverage from this perspective could provide new criteria for the evaluation of risk coverage that would complement the criteria relating to the profession in general (Harcup, 2004; Kovacs and Rosenstiel, 2001) and more specific risk-focused criteria, for example, the *Guidelines on Science and Health Communication* (Social Issues Research Centre, 2001). Such criteria refer to:

- Reliability (attribution to sources and verification of facts);
- Fairness (to sources and the public);
- Balance (allowing different perspectives to be heard);

- Independence (no commercial or political dependency);
- Distance (impartiality);
- Relevance (information about relevant developments and social problems);
- Social responsibility (self-reflection and accountability).

The evaluation of media coverage is often limited to the general professional standards referred to above, and, most importantly, is applied to individual articles. To explore a new, more comprehensive approach for evaluating the media, a two-stage research project was carried out. First, a content analysis of news flows was performed to examine how the media cover two completely different risk topics. The second stage of the project comprised consultation with key people in the relevant sectors using semi-structured interviews. The main question here concerned how to improve media coverage and communication on risk topics.

Content analysis

Two different risk issues were chosen for the content analysis: first, the growing protest in the Netherlands against the construction of universal mobile telecommunications system (UMTS) relay stations, which provide for a new generation of broadband multi-media mobile telecommunications technology, offering Internet at high speed on mobile phones; and, second, the problem of fine particle air pollution (FPP).

According to the World Health Organization (WHO), fine particles (also referred to as 'particulate matter' [PM]) consist of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. Chronic exposure to particles affects more people than any other pollutant because it increases the risk of developing cardiovascular and respiratory diseases, as well as lung cancer.

The main reason for this selection centres on the completely different ways in which these risks are constructed and perceived in society and by the media.

In the case of UMTS, there is a great deal of uncertainty about the actual risks for public health – that is, the negative effects have yet to be proven (Sienkiewics and Kowalczuk, 2005). Conversely, the risks of FPP are relatively certain in terms of mortality, even though estimates vary (Buringh and Opperhuizen, 2002). In the former case, the risk is perceived as involuntary, which fuels the outrage (e.g. 'we don't want this on our roof'); in the latter, this is irrelevant because people have no individual choice (everybody is exposed to air pollution). Whereas many local residents in the

Netherlands are trying to prevent the installation of new relay stations, there have only been a few protests against FPP. The legal and political contexts also differ: FPP exceeds legal limits but UMTS operates well within national and international regulations. These two cases offer interesting challenges and dilemmas for the media in a way that can be used to hone the criteria for the evaluation model.

UMTS and FPP as risk issues

Growing resistance to UMTS

In 2005, more than 40 city councils in the Netherlands decided to postpone the implementation of new UMTS base stations in response to growing protest among people living in the areas where the stations were planned. The main reason for the opposition rests on people's concerns about the health effects of the electromagnetic fields surrounding the masts. In 2000, mobile phone companies paid the Dutch government over €2.7 billion for UMTS frequencies. With the cooperation of the Dutch government and city councils, it was planned that a nationwide network would be established by 2007. In 2003, the Dutch Organization for Applied Scientific Research (TNO) published the results of a double-blind study (Zwamborn et al., 2003),[1] which examined the effects of exposure to GSM[2] and UMTS signals on self-reported well-being and cognitive functions. A small, but statistically significant effect on people's 'well-being' was reported after exposure to UMTS signals. The study was heavily criticized (Health Council of the Netherlands, 2004; NIRMED, 2004), but nevertheless attracted a lot of media attention both in the Netherlands and internationally. It was often presented as the first 'evidence' of health risks related to UMTS signals. Subsequently, resistance to the rollout of the UMTS-network increased, even with people forming human blockades. The city councils were in the middle of the conflict, with worried citizens on the one side and companies threatening lawsuits on the other.

FPP 'solved'

In 1995, the Dutch Health Council issued a warning about the effects on people's health of fine particles present in the air from traffic, industry and natural sources such as sea salt; it was estimated that these were causing more than 600 premature deaths a year in the Netherlands. A few years later, environmental groups tried to get this 'chemical nightmare', as they labelled it, onto the political agenda but it was not seen as an important issue. In 2002, new

research estimated that between 1700 and 3000 premature deaths a year were caused by FPP (Buringh and Opperhuizen, 2002). Furthermore, prior to this study, in 1999, the EU had issued new air quality directives to address the problem of FPP by imposing stricter emission limits. The new policy had to be implemented by 2005, but the Dutch government was not capable of reducing the high concentration of FPP in urban areas. The government tried (albeit in vain) to postpone the implementation until 2015.

It was not until 2005 that FPP became an important issue: the reason being that several large building projects were brought to a standstill by court judgements. These projects violated EU regulations, because they increased FPP levels. This brought the issue to the front pages of the newspapers in 2005. In some 'dirty' areas, the residents (backed by environmental groups) protested against the pollution and the failure of government policy. However, in contrast to Germany where FPP had caused a public outcry (with the German car manufacturers especially under attack), the situation in the Netherlands prompted limited public protest. The political debate focused on how to solve the problem but without damage to the Dutch economy. The cabinet introduced a new law on air quality stating that only large building developments (leading to a 3 percent national increase in air pollution) were required to meet the EU criteria. Only 5 percent of projects fell into this category and the restrictions were lifted for the rest. Moreover, the Dutch cabinet decided to balance out the number of 'dirty' and 'cleaner' areas, thereby providing a positive result for the Netherlands as a whole. Project developers and builders were able to proceed once more. As a consequence, FPP became a much less prominent topic in the news. The problem appeared to have been 'solved' by the government – at least in the short term.

Owing to the differences in form between these two issues, both are very suitable for a comparative analysis of media coverage.

Research questions

For the content analysis of newspaper coverage on UMTS and FPP, the following research questions were formulated:

1. Who are the most important sources in the coverage? Sources are defined as people (or organizations/institutions) who are quoted (directly) or paraphrased (indirectly).
2. Who has the most power to define the issues at stake? Actors are defined as people who are talked about: they are either in the

subject position (i.e. someone mentioned as saying or doing something) or in the object position (i.e. someone being talked about). An actor has more so-called 'defining power' when he or she is in the subject position and when quoted directly. Defining power is determined by using a formula[3] that includes direct and indirect quotes of sources and the subject/object positions of actors.

3. What are the most important issues in the news and which actors relate to which issues?
4. How do the media evaluate the different actors?
5. Which frames can be observed in the coverage? Frames are defined as a specific construction of a problem; they describe causes, consequences, accountabilities, perspectives and solutions.
6. Whose language is being used in the coverage? To describe the risk issue, the media can use verbal expressions from non-experts and/or experts.
7. How, and how often, do the media report scientific evidence?

Methodology

The programme INET was used for the content analysis of the articles. This is based on the so-called NET method (a network analysis of evaluative texts). The method is derived from Osgood's (1956) evaluative assertion analysis and centres on the idea that the explicit or manifest content of a text can be depicted as a *network* consisting of relations between *meaning objects*. To map the content of a text into a network, texts are parsed into nuclear sentences, each of which connects one *meaning object* to another (de Ridder and Kleinnijenhuis, 2001; Van Cuilenburg et al., 1986). *Meaning objects* can be actors, sources or issues and the relationships between them exist by means of verbal connections, which have an evaluative direction, that is, and they can be positive, negative or neutral. Apart from this, the nuclear sentences were also coded according to the operational questions inferred from the general characteristics of several (predefined) frames. This makes it possible to find out which frame dominates in the coded articles.

The UMTS sample

Five Dutch newspapers were selected for the present study: two national dailies: *De Telegraaf* (with a circulation of 765,000 in 2005) and *de Volkskrant* (289,000); and three regional newspapers: *Amersfoortse Courant* (142,000), *De Gelderlander* (170,000) and *Twentse Courant/Tubantia* (124,000). Because

UMTS is perceived as both a national and local issue, both national and regional newspapers were included. From a period of two years, three (two-month) 'waves' of UMTS news were selected for analysis: October–November 2003; December–January 2004/5 and July–August 2005. The reason for this choice is that during these months the newspapers paid the most attention to the problem. This sample resulted in 98 articles, which once coded, resulted in 2664 statements for analysis.

The FPP sample

In the case of FPP, it was decided to restrict the sample to national dailies over the past five years because this kind of pollution is essentially defined as a national problem. The following national newspapers collectively published a total of 252 articles on FPP between January 2001 and February 2006 (62 months): *Algemeen Dagblad*, *De Telegraaf*, *de Volkskrant*, *Trouw* and *NRC Handelsblad*. The majority of these articles (68 percent) were published in 2005 (171), with the remaining 81 evenly spread over the other years. Over this time period, the frequency of articles on FPP was similar across all newspapers. After coding the articles, the dataset contained 2949 statements.

Results of the quantitative content analysis of newspapers

Sources and actors

Sources are quoted or paraphrased in the news, while actors are talked about, either as subject or object. These different positions can be seen as an indication of the amount of power that actors have in defining the issues in the news. The actor who is given a central role in the article (i.e. being quoted extensively, mentioned in the headline, etc.) is assumed to have a strong influence on the content of the article.

Actors who are rarely quoted and/or paraphrased, and who are more often in the object than in the subject position, seem to have the least defining power in the news. They are mainly talked about and do not get an opportunity to deliver a quote themselves. The implication is that they have little authority in the news. The content analysis yielded the following results.

Regarding the sources used in the coverage, there was a striking difference between UMTS and FPP (see Figure 1). While news sources like residents and action groups played a very important role in UMTS (in terms of quotes and paraphrases), they were far less prevalent in FPP coverage. Rather, this coverage was completely dominated by 'official' sources (i.e. government consultants, national politicians and experts), delivering the
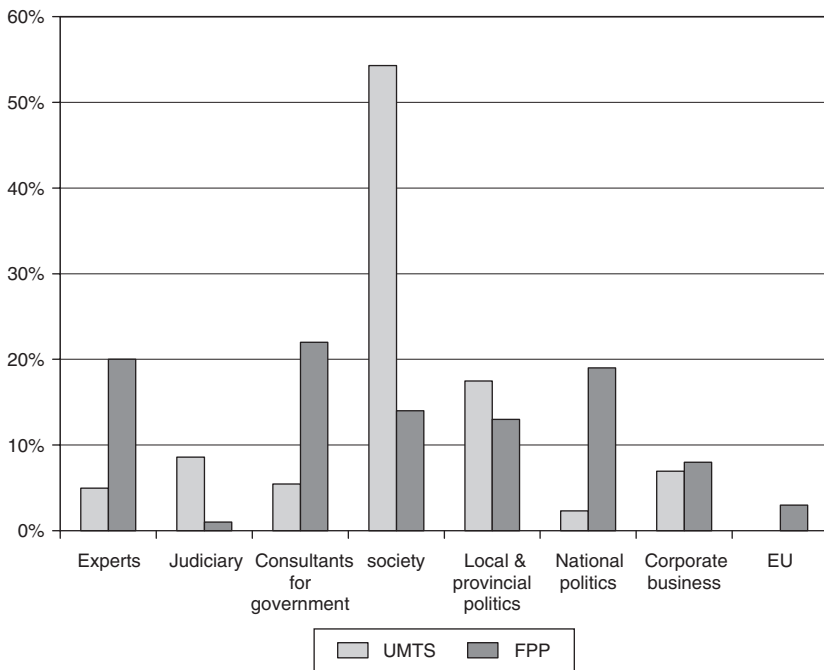
Figure 1 Share of sources quoted and paraphrased in the news on UMTS and FPP

majority of all quotes and paraphrases. Although UMTS is controversial on the question of whether or not there is a risk, it was surprising to find that, as sources, experts represented a very small share of the news.

Actors with defining power

In terms of defining power, residents (society) dominate the UMTS cover-age (43 percent), followed by local politicians (with about half as much) and then telecom operators/corporate business (see Figure 2). In the FPP news, defining power is equally divided between government consultants, experts and national politicians, each with a score of about 20 percent. Corporate business is in approximately the same position for both issues.

Issues and actors

What are the main issues addressed in the news on UMTS and FPP and which actors are presenting which issues? The issues were divided into four categories:
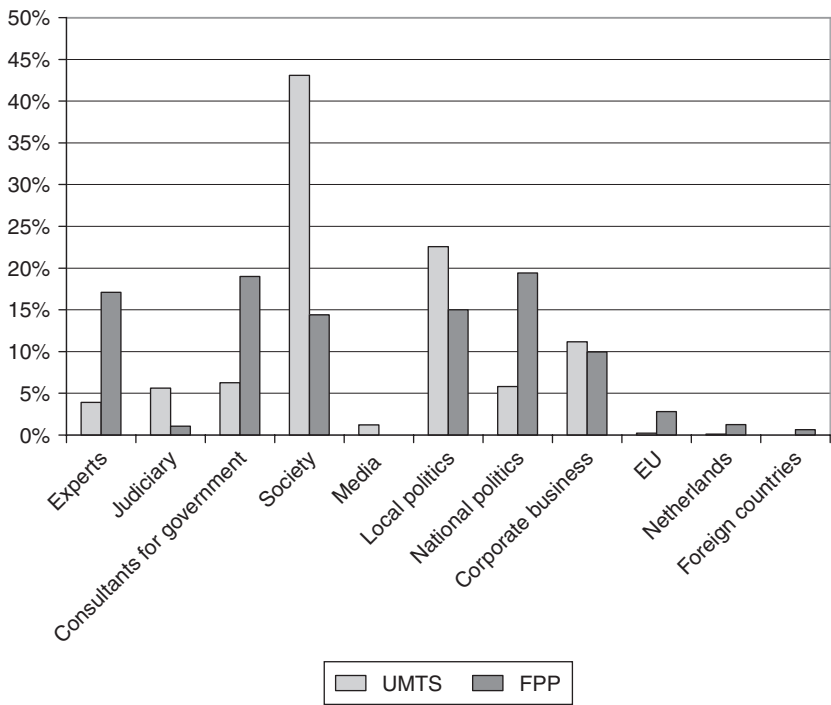
Figure 2 Actors' defining power in UMTS and FPP coverage

1. General information on UMTS and FPP (i.e. news about UMTS technology and network rollout; news about fine particle emissions, legal limits, court decisions, etc.);
2. The risk and consequences of UMTS and FPP (i.e. health complaints/problems, risks, air pollution, mortality rates);
3. Resistance (i.e. protests, action taken against FPP and UMTS);
4. Government policy (i.e. its decisions and actions concerning FP and UMTS).

The findings indicate that while the share of coverage given over to risk and consequences are similar, those pertaining to the general information, resistance and policy are very different between the two issues (see Figure 3). The content analysis also shows that residents, as actors, have a very large share in UMTS issues, risk and consequences, and resistance, while local politicians dominate the policy issue. Regarding FPP, however, the picture is rather different: national politics generally dominate and mainly address policy
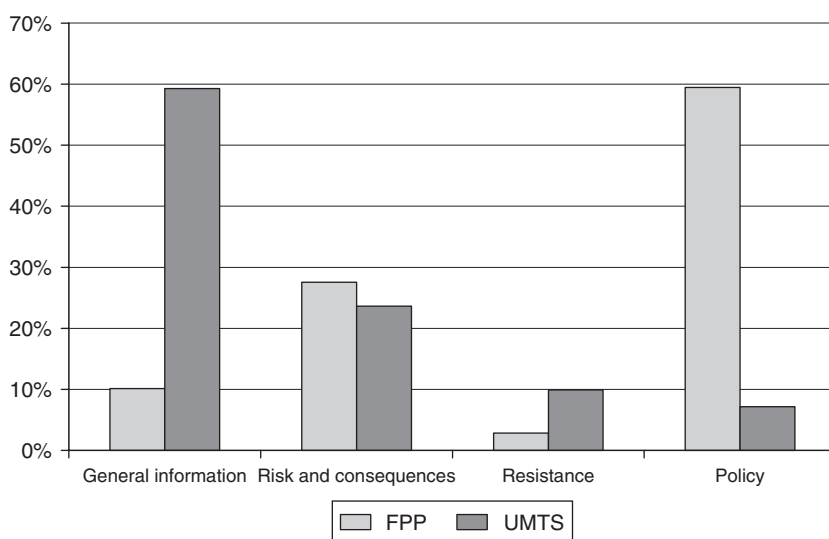
Figure 3 Share of the four issues in the news on FPP and UMTS

matters. Overall, in the case of both UMTS and FPP, national and local politics mainly address policy issues and general information, while society focuses on risk and consequences and resistance. These results, combined with the observation that the coverage is dominated by official sources, confirm that the issue of fine particles is not defined in terms of worried residents, but rather in terms of a governmental issue. The question is how to deal with this kind of air pollution without damaging the economy.

Media evaluation of the actors

In the case of UMTS news, the results from the content analysis show that the media are positive towards action groups and citizens, negative towards property owners and telecom operators, and neutral about local politics. For FPP, however, the media are negative towards the government at all levels and neutral with regard to corporate business. Overall, the media are critical towards the government (FPP) and telecom operators and property owners (UMTS), whereas they are positive towards residents and action groups (UMTS) and neutral towards corporate business (FPP).

Frames

To evaluate media coverage on UMTS and FPP, it is necessary to establish how the media frame the problem and which actors and sources play a dominant role in this process.

The following considerations are important in framing a risk issue:

- Problem construction: is there a problem or a risk?
- Perspective: which angle is used to define the problem or risk (economic, health, etc.)?
- Cause: who or what causes the problem or risk?
- Consequences: what are the consequences of the problem or risk?
- Accountabilities: who can be held accountable for causing and/or solving this problem or risk?
- Solutions: how can the problem or the risk be solved?

On the basis of these questions, several specific frames were defined:

1. The *precaution* frame defines the problem as a potential health risk that demands government action, even if definitive scientific proof still remains absent. 'Better safe than sorry' is the motto.
2. The *scientific* frame states that the exposure people worry about is not a problem as long as the emissions are within the official, evidence-based, limits. People worry because they have not been sufficiently informed by the authorities or are being misled by action groups.
3. The *technocratic* frame maintains that the problem can only be solved by balancing the different interests involved. It is important to address the worried citizens but not without losing sight of political and economical interests.
4. The *scandal* frame is built on outrage over the fact that people have already been exposed to harmful emissions. The authorities were well aware of the risk, but decided to let commercial interests prevail over the care of their citizens. There is a scandal and drastic action has to be taken. Those responsible have to resign.

In the content analysis[4] for each frame, three to five operational questions were used to establish whether a statement fitted within one of them. Figure 4 illustrates the overall results for both UMTS and FPP and shows that there is a remarkable resemblance in the use of the four frames. The precaution frame dominates (60 percent), followed by the technocratic
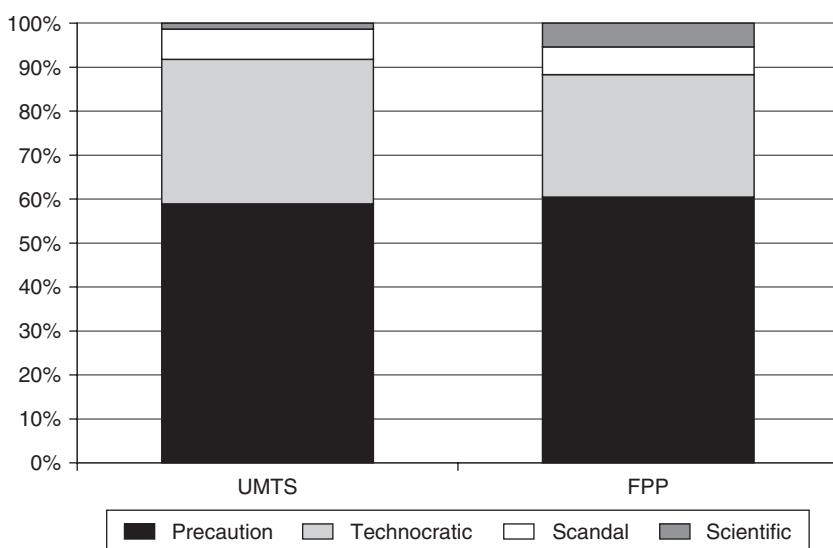
Figure 4 Frames in UMTS and FPP coverage

frame (33 percent and 28 percent for UMTS and FPP respectively). The corresponding percentages for the scandal frame were 7 percent and 6 percent and those for the scientific frame were 1 percent and 5 percent.

This means that despite the large differences between UMTS and FPP, the news media define both issues in terms of 'there is a risk and something has to be done' and 'solutions have to take into account the different interests at stake'. In the case of FPP, one might have expected a larger share of scandal because there was evidence of damage to public health (in contrast to UMTS) in conjunction with a failing government (not able to meet EU regulations). However, this was not the case: use of the scandal frame was very small in the FPP coverage. It seems likely that the dominance of expert sources was responsible for this.

Looking at each newspaper individually, the differences in framing are negligible, with one exception. One regional newspaper defined UMTS relatively strongly in terms of the scandal frame; the other newspapers followed the same framing patterns regardless of their editorial formats and target groups.

Finally, we examined two other characteristics of the UMTS coverage: the language used and the way the media dealt with the results of a study into the effects of UMTS electromagnetic fields on well-being.[5]

Language

Experts and non-experts alike use different expressions and words to describe the risk of new technology like UMTS. Experts define the problem using scientific concepts, while non-experts define the risk more in terms of everyday life worries.

Typical of the vocabulary used by experts are concepts like: *electromagnetic fields*, *radio frequencies*, *thermo and non-thermo effects*, *exposures within safety limits*, etc. Experts define risks in terms of probabilities, while laypersons have a more binary approach: there is a risk or there is not. Non-experts use words like *UMTS radiation* in combination with negative connotations like: *electro-smog, electro-stress* and *electro-allergy*. They talk about *radiation victims, UMTS pollution*, *contaminated areas, radiation explosions* and *high doses of radiation found in victims*. Laypersons are, in fact, often using the vocabulary of nuclear energy to describe UMTS emissions.

A lexical analysis of the different types of language used in the articles yielded the following results. In total, the words belonging to the non-experts' vocabulary occurred 262 times in 98 articles. In contrast, expert terms were only mentioned 62 times.

The regional newspaper *Tubantia* used the word 'radiation' the most frequently (77 times in 30 articles) while the national daily *de Volkskrant* used it the least (7 in 11 articles). *De Telegraaf* (national daily) mainly used words like 'electric pollution', 'electro-stress' and 'radiation' (17 times in 14 articles).

In conclusion, newspaper coverage that includes experts' vocabulary is limited in contrast to the layperson's term 'radiation' (or negative phrases that include it), thereby reinforcing the analogy with nuclear risks.

Representation of a scientific study

An important event in the UMTS coverage was the publication of the TNO study in October 2003, which investigated the impact of GSM and UMTS electromagnetic fields on subjective feelings of well-being and cognitive performance (Zwamborn et al., 2003). In a double-blind experiment, the TNO exposed two groups, each consisting of 36 participants, to UMTS and GSM signals. One group consisted of people who had reported complaints about UMTS fields before the experiment whereas the other one (the control group) was composed of people without such complaints.

The main result was that UMTS electromagnetic fields showed a statistically significant link with certain aspects of well-being in both groups. This contrasts to GSM, where no link was found. Moreover, an

improvement in cognitive performance was found after exposure to UMTS signals. Measures of well-being were based on self-reports of the following symptoms: *anxiety*, *somatic*, *inadequacy*, *depression* and *hostility.* Only with regard to levels of *inadequacy* did UMTS exposure show differences in well-being.

The researchers emphasized in their press release that it was not possible to conclude from these data that UMTS had a detrimental impact on health and recommended that further research was necessary. After publication, other researchers criticized the TNO study for its methodological shortcomings. These included the selection of participants in both the experimental and control groups, the short sessions of exposure (risk of contamination), the questionnaire used to establish well-being and the statistical analysis of the data. The Health Council of the Netherlands (2004) evaluated the TNO report and concluded that there was no evidence of a link between UMTS exposure and negative impact on well-being or health.

Analysis of the 98 articles in our newspaper sample showed that 46 statements were made on the TNO study in 42 articles. In most cases, the TNO study was only briefly referred to in one or two sentences. The general perception of the TNO research in these newspapers is that the study established a link between UMTS radiation and health. Sometimes the statements refer to just a link; sometimes they report a damaging effect on health or well-being. The symptoms were often mentioned, but the concept of well-being was never explained. Information on the research design and the statistical analyses was absent from most articles. Only the articles published the day after the release of the report offered more detail, but this information was often presented with a negative bias in the headlines (e.g. 'TNO: UMTS Stations Bad for Health'). Only in a small minority of the articles was attention paid to scientific criticism and concerns about the research methodology. Regarding the coverage of the TNO study, we conclude that the press created a rather black and white image of the research, obscuring the limitations of the results.

Consultation project

The second part of our project involved consultation with key people in the domains of science, communication, media and government. The goal of this series of 21 in-depth, face-to-face interviews was to collect ideas and proposals for the evaluation of media coverage on risk topics.

Selection of interviewees

The key people were selected to represent four groups of actors:

- Producers – scientists who provide professional advice;
- Users – decision makers;
- Media – opinion formers;
- Society – civil groups and organizations, citizens, etc.

By choosing people active in these different areas, it was possible to look at the problem from a diversity of perspectives. For each interview, a semi-structured protocol was used enabling the interviewee to talk about topics linked to their specific field of expertise.

Purpose of the interviews

The focus of the interviews centred on the question of how to improve communication on risk topics. This was not restricted to communication generated by the media, but also that by the government and scientists. The key question concerned how to deal with risk amplification when risks are negligible, or with the absence of amplification when risks are evident. How do the respondents analyse this problem and what kind of advice do they have for the media, the scientists and the government?

Results of the consultation

Media coverage as response to other actors   The most surprising result is the somewhat mild attitude of the interviewees towards the performance of the press. Of course, there was criticism and some of the stakeholders in particular were quite dissatisfied with media coverage. Overall, however, the interviewees stressed that in many cases the media report what they have to report and when things go wrong, it is more often the scientist or the government who is to blame. When researchers make strong statements about the results of their study into the effects of UMTS, for example, it is hardly surprising to subsequently see powerful headlines. The same can be said of the role of the government. When its response to publications in the media or to the actions of worried citizens is inadequate, negative coverage can be expected. Media-hype (Vasterman, 2004) is the result of social unrest and not the trigger of unrest, according to one of the respondents. Politicians quickly respond to the daily hypes while neglect-

ing the long-term problems and thereby exacerbate the hype. Whether or not media-hype is triggered depends on the response of the government, or a company, to a crisis situation.

Conflict and distrust   The media focus on conflicts of interest and controversial issues regardless of the tenability of the claims of different stakeholders, be they the government or a citizens' website. Distrust of official sources and powerful actors (e.g. the government) is a basic attitude taken within the media. The health angle is much more important for the audience – and hence the media – than the probabilities computed by scientific risk assessment. Some of the interviewees stressed the importance of the journalistic duty of publishing important facts, irrespective of the negative reactions by government.

Criticism of the media   Nevertheless, in many interviews, the media were criticized because they frame issues in a specific way, they use value-laden words and do not pay enough attention to the (self-serving) interests underlying claims and statements. Interviewees noted a difference between the science editor and the general reporter, who is not able to place a specific risk in the broader context of other risks. By paying a lot of attention to a topic, the media make it appear important and frightening in the eyes of the public. The media often want definite answers instead of statements about potential probabilities. Moreover, the media do not take responsibility for the social unrest their coverage might initiate. Some of the interviewees emphasized that the media can play the role of catalytic agent in a process, which, once triggered, cannot be stopped.

Science communication   The respondents placed the performance of the media in the context of what the other actors were doing: the scientist who publishes a report, the communication officer who issues a press release, the policy of the government, etc. The media tend to reflect what their sources do and say.

The interviewees were critical towards the scientists because they pay insufficient attention to the way they publish results and fail to understand that the public may interpret the findings quite differently. In attempting to be as subtle as possible (in terms of probabilities), they fabricate ambiguous statements that can be interpreted by the media and the audience in many different ways. Scientists are not sufficiently aware of the fact that some topics are very media sensitive and can generate substantial social unrest.

Role of the government   Media coverage is closely linked to government policy and communication. Slow responses, a lack of openness on the side of the government, divisions and tensions between different levels of government – all these factors influence the way the media cover an issue. In some risk issues, there may be a conflict of interest for the government: the state is investing in new technologies (i.e. makes money by selling UMTS frequencies), but at the same time, the government has a social responsibility to care for its citizens. This conflict of interest leads almost by definition to a critical and distrustful press.

The stakeholders (i.e. corporate business, environmental groups, etc.) also play an important role in the process and the media coverage. The commercial stakeholders find it more difficult to get their message across than do the action groups, who seem to have more instant access to the media. For commercial groups, it is difficult to communicate about risk topics because the media distrust them especially. Their critics, on the other hand, say that the corporations do not pay attention to the worries of the public when a new technology is introduced. They have a tendency to move forward, without consultation, thereby creating the impression of cover-up and secrecy as far as the media and the public are concerned.

Social context influences on media   Looking at the differences in the interviews, it is interesting to see that there was unanimity on the issue of the media's role (one possible exception was commercial stakeholders, who are much more critical towards the media). For the evaluation model, it is important to notice this unanimity and to base the model on the observation that the media operate in a social context where other actors like the government are also active. The latter's performance has a strong impact on media coverage. Within this context, the media have their own role and responsibility.

Evaluation model for media coverage on risk

What can be learned from the content analysis and the consultation in terms of the evaluation of the media? The content analysis of the UMTS and FPP coverage showed remarkable results: the UMTS coverage was dominated by layperson sources, whereas the news on FPP was in the hands of official sources. Experts enjoy a negligible share in the UMTS news in contrast to the FPP. Telecom operators and corporate business sources were in a minority for both issues. This reflects differences in the activities by the social actors: some are passive, others very active.

Sources

In contrast to the usual criticism, the media do not always use the same sources when reporting on risk issues. Worried citizens are not always the most important sources for the media. FPP is one such example, where the share of society sources is relatively small. One might ask whether coverage dominated by the experts is superior to coverage where laypersons get the largest share. From the point of view that the media should adhere to the scientific perspective on risk, the FPP coverage might be better. However, bearing in mind that the media should try to connect with what people think and feel when a specific problem arises, the UMTS news flow might be better. Applying the professional standard of balance to the coverage as a whole, the conclusion must be that the media should give an equal voice to the relevant actors in society, even if some of them are not very active in accessing the media. This is an argument for news coverage that operates more independently of what sources do. Some of the interviewees also maintained that the media are too much a part of the system and that they should take a broader perspective.

Frames

The selection of sources has an impact on which aspects get covered and which frames are used. Although the shares of risk and consequences in the coverage of UMTS and FPP were almost the same, other aspects (i.e. general information, resistance, policy) differed. In the case of FPP, the problem was mainly defined as a policy issue, while in UMTS coverage, general information on technology dominated.

Despite the differences in sources and issues, the framing of both UMTS and FPP showed a remarkable resemblance. In both cases, the precaution frame is dominant, followed by the technocratic frame. The scandal frame and the science frame were found less often in the coverage, although scandal is more important in the case of UMTS.

In the case of FPP, one might expect a larger share of scandal framing because there is more evidence of public health damage in conjunction with a failing government. However, this proved not to be the case. It seems likely that the dominance of expert sources was responsible for this. For the same reason, the scientific frame was also extremely small. In contrast to what some critics say, the media do not report risk issues predominantly in terms of scandal – not even in a case like UMTS, where worried citizens dominate the coverage.

In the evaluation of media coverage, one might ask whether coverage on FPP should have been more like UMTS coverage (i.e. more non-expert sources, more scandal and more outrage). After all, the problem of FPP remains unresolved and there are still premature deaths occurring due to this kind of pollution. In the case of UMTS, the remaining question is how to pay more attention to the scientific and technocratic frame, when social outrage dominates media coverage.

Scientific coverage

Regarding the coverage of the TNO study on the effects of UMTS, the conclusion was that the media describe the link between radiation and health complaints as an established fact, using negative headlines. This is in line with criticism about the way in which the media often deal with scientific results. On the other hand, however, it is reassuring to realize that the scientist also plays a very important role in the way the media make news out of a report. As commented in some of the interviews, it is important for the scientist to take into account that certain words (e.g. 'radiation') and phrases (e.g. 'significant link') can be very sensitive and foster images of absolute facts about frightening risks. It is important the scientist remains involved in the public debate once the press release has been sent to the media.

Criteria evaluation model

The goal of the study was to develop an evaluation model for media coverage on risk that takes into account the social and political context in which the media function. The results of the content analysis and the consultation can be integrated in the following criteria for evaluation, defined at the level of news flows as a whole.

1. *Sources:* does the coverage show a variety of sources? It is not sufficient to report exclusively on the active sources.
2. *Frames:* framing is inevitable, but is one specific frame dominating the whole coverage? Do the media use the same frame for different risk issues or do they apply different frames for different risks? How is this related to the sources used?
3. *Amplification:* do the media contribute to the process of risk amplification by promoting one specific frame and giving a voice mainly to those sources supporting this frame?

4. *Risk perception:* do the media take into account the way laypersons perceive risks and do they specifically address these judgements in relation to scientific risk assessment?
5. *Scientific data:* is enough attention paid to the probability perspective of science, or do the media present scientific data as definititive answers?
6. *Language:* are the media sufficiently careful in their use of value-laden words connected to certain frames and images?

In using these evaluation criteria, it is important to emphasize that the media always operate in a social context in which the actors define the issues and the frames. Furthermore, it is a context in which events take place that are not newsworthy because of the risk topic per se, but because of the events themselves (e.g. a protest march). On the other hand, within this social context, the media have their own journalistic responsibility to report in a balanced way on risk topics. The evaluation model offers concrete starting points for the reporter who has to cover these risk issues.

Notes

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1. This study was replicated in Switzerland and showed no link between exposure and well-being (see S.J. Regel et al., 2006).
2. GSM stands for global system for mobile communications. GSM technology preceded UMTS.
3. Defining power is based on the following formula:

$$\frac{(1*source) + (2/3*paraphrase) + (1/3*subject) + (0*object)}{(source + paraphrase + subject + object)}$$

4. In the UMTS coverage, 146 framing statements were found in 91 articles. Seven articles contained no framing statements. In FPP coverage, a total of 316 framing statements were found in 203 of the 252 articles sampled. Half of the articles contained two or three such statements.
5. This was not done in the case of FPP because the language used here was mainly associated with experts' vocabulary.

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