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The Content Analysis of Media Frames: Toward Improving Reliability and Validity

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The main purpose of this study was to shed light on methodological problems in the content analysis of media frames. After a review of 5 common methods, we will present an alternative procedure that aims at improving reliability and validity. Based on the definition of frames advanced by R. M. Entman (1993), we propose that previously defined frame elements systematically group together in a specific way. This pattern of frame elements can be identified across several texts by means of cluster analysis. The proposed method is demonstrated with data on the coverage of the issue of biotechnology in The New York Times. *It is concluded that the proposed method yields better results in terms of reliability and validity compared to previous methods.*

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Over the past decades, the study of frames and framing has been rapidly expanding (e.g., Entman, 1993; D'Angelo, 2002; McCombs, Lopez-Escobar, & Llamas, 2000; Reese, 2007; Scheufele, 1999; Weaver, 2007). A lion's share of this research is devoted to the assessment and description of frames in the news. However, many scholars have raised concerns about the reliability and validity in the content analysis of media frames (Gamson, 1989, p. 159; Gandy, 2001, pp. 360–361; Hertog & McLeod, 2001, p. 153; Miller, 1997, p. 376; Scheufele, 1999, p. 103; Tankard, 2001, p. 104). More specifically, a frame is a quite abstract variable that is hard to identify and hard to code in content analysis. As a result, "it is extremely difficult to neutralize the impact of the researcher in framing research" (Van Gorp, 2005, p. 503). Or, as Maher (2001) puts it, "[framing] has proved to be an elusive concept to measure" (p. 84). To reflect this expanded concern, the aim of this study was to outline an empirical method for the reliable and valid assessment of media frames. In a first step, we will review the methods that are commonly used by framing scholars. Based on that, we will present an alternative measurement procedure that aims at improving reliability and validity. After this, we will demonstrate the usefulness of this approach with

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a content analysis on the issue of biotechnology. Finally, we will discuss the benefits of that method and outline some implications for future framing research.

The content analysis of media frames

Examining the extensive literature on media framing, five different methodological approaches for the measurement of media frames can be distinguished: a hermeneutic approach, a linguistic approach, a manual holistic approach, a computer-assisted approach, and a deductive approach. It is important to stress that these five approaches are not mutually exclusive. Therefore, the aim of the following section is to provide a broad overview of how communication scholars have tried to measure such abstract variables as media frames.

Hermeneutic approach

There are a number of studies that try to identify frames by providing an interpretative account of media texts linking up frames with broader cultural elements (Boni, 2002; Coleman & Dysart, 2005; Downs, 2002; Haller & Ralph, 2001; Hanson, 1995; Tucker, 1998). Rooted in the qualitative paradigm, these studies are based on small samples that mirror the discourse of an issue or an event. Typically, frames are described in depth and no quantification is provided. For instance, Tucker describes the media discourse about a Calvin Klein jeans campaign. In her frame analysis of 31 articles, Tucker deconstructs the so-called "kiddie-porn frame" and describes how the media characterized the campaign.

Although most of these studies are well documented and exceptionally thorough in their discussion of media frames, it is fairly difficult to tell how the frames were extracted from the material. For instance, Hanson (1995, p. 384) simply states that the anticolonial frame "emerged from the analysis"; Haller and Ralph (2001, p. 412) indicate that "news frames were found"; Coleman and Dysart (2005, p. 13) assure that "a deep reading […] informed the authors of the emergent frames"; and in Boni's (2002) study, there is no hint at all about how the frames were extracted. As Simon (2001) puts it, this raises questions about selection bias and robustness of the frames identified. Likewise, Tankard (2001) states that "there is a danger in this kind of lone-scholar analysis that the identification of a set of possible frames can be done arbitrarily" (p. 98). Therefore, researchers run the risk of finding frames they are consciously or unconsciously looking for. This problem is directly acknowledged in some studies. For example, in his critical discourse analysis of 31 major newspapers, Downs (2002) admits the inherent subjectivity of the hermeneutic approach: "Researchers bear the burden of supporting personally observed claims, and support is more experiential and contextually contingent than empirical" (p. 47). Hence, "careful description may be the only way to convince readers of a frame's existence and validity" (Downs, 2002, p. 48). As should be apparent, there can be a threat to reliability because the extraction of frames may differ across researchers and coders. Unfortunately, although these studies without doubt contribute to the accumulation of knowledge in the field, scholars often have been inattentive to these difficulties, and consequently, methodological clarity has been unnecessarily impeded.

Linguistic approach

In linguistic studies, frames are identified by analyzing the selection, placement, and structure of specific words and sentences in a text (e.g., Entman, 1991; Esser & D'Angelo, 2003; Pan & Kosicki, 1993). Usually, the unit of analysis is the paragraph, not the article. The basic idea is that specific words are the building blocks of frames (Entman, 1993). The linguistic approach is similar to the hermeneutic studies described above. However, the crucial difference is that linguistic researchers clearly determine linguistic elements that signify a frame. The most elaborate linguistic approach stems from Pan and Kosicki (1993). The authors distinguish structural dimensions of frames that can be measured: syntax, script, theme, and rhetoric. Following the linguistic frame analysis by Pan and Kosicki (1993), researchers have to construct a data matrix for every single news text. In this matrix, the signifying elements for every single proposition are analyzed. Clearly, one major advantage of this approach is the systematic and thorough analysis of news texts. However, the inordinate complexity of this method (Esser & D'Angelo, 2003, p. 624) makes a standardized frame analysis with large text samples rather difficult to accomplish. Furthermore, it remains a bit unclear how all these features are finally woven together to signify a frame.

Manual holistic approach

In another line of research, frames are first generated by a qualitative analysis of some news texts and then are coded as holistic variables in a manual content analysis (e.g., Akhavan-Majid & Ramaprasad, 1998; Meyer, 1995; Simon & Xenos, 2000; Segvic, 2005). For instance, Simon and Xenos conducted an in-depth analysis of some newspaper articles in the first step in order to generate six working frames. After that, these frames were defined in a codebook and coded in a subsequent quantitative content analysis. As should be apparent from our discussion of the hermeneutic method, the reliability and validity of this approach strongly depend upon the transparency in extracting the frames. However, in some studies, it remains unclear how researchers determine their frames. For instance, Meyer (1995, p. 178) merely "identif[ies] three master frames," Akhavan-Majid and Ramaprasad (p. 144) assure the reader that "the qualitative assessment of framing was based on careful reading," and in Segvic's study, it remains entirely unclear how the frames were found. From a methodological point of view, the problem is the same as with the hermeneutic approach: Without naming the criteria for the identification of frames, their assessment falls into a methodological black box. In other words, one runs the risk of extracting researcher frames, not media frames. This is because the perception and coding of frames strongly depend upon how the researcher perceives the issue. In most studies, there is no criterion for which frames, and how many, are to be found. Considering the immense complexity of most issues examined (i.e., health care, terrorism), an objective—that is, a researcher-independent assessment of frames—is hard to accomplish. An additional caveat needs to be highlighted: Once the frames are defined, other frames are difficult to discover. This is because researchers or coders themselves develop an "audience" or "coder" frame (i.e., coder schemata) on how to perceive the issue (Wirth, 2001). There might be a tendency to press an article into an already existing frame category. Therefore, once the frames are defined and coder schemata are developed, it might be difficult to observe the emergence of new frames.

Computer-assisted approach

Miller (1997, p. 376) also points to the fact that we need to find more objective and reliable methods. Therefore, Miller and colleagues (Miller, 1997; Miller, Andsager, & Riechert, 1998) suggest a new, more quantitative procedure: the so-called "frame mapping." Based on the notion that frames are manifested in the use of specific words (Entman, 1993), the authors seek to identify frames by examining specific vocabularies in texts. Frame mapping is described as a method of finding particular words that occur together in some texts and do not tend to occur together in other texts (Miller, 1997). Words that tend to occur together in texts are identified with the help of cluster algorithms. One obvious advantage of this method is the objectivity in frame extraction. Frames are not "found" by the researcher but "computed" by the computer program. In one frame mapping study, Miller et al. compare the frames advanced in press releases distributed by Republican U.S. presidential candidates in the 1996 primary elections with the frames emphasized in news stories about these candidates. The authors identify a total of 28 frames. For example, the words charity, charities, charitable, and money form the "charity frame." Although this method has made a significant contribution to framing literature, it reduces frames to clusters of words. As Carragee and Roefs (2004) put it, the frames identified by Miller et al. are story topics rather than frames. Also, Hertog and McLeod (2001, p. 152) note that some words need not occur very often in spite of being central to the meaning of a text. Thus, the major shortcoming of frame mapping is not the lack of reliability but the lack of validity.

Among computer-assisted methods, *dictionary-based approaches* such as frame mapping have received the most attention. However, there are a few other studies that have advanced computer-assisted content analysis by moving beyond the grouping of words (e.g., Jasperson, Shah, Watts, Faber, & Fan, 1998; Shah, Watts, Domke, & Fan, 2002). Such studies can be summarized under the label *syntactical approaches*. For instance, Shah et al. used the Infotrend computer program in their extensive content analysis of 19,085 electronic articles. In essence, their analysis consists of three steps: first, entering idea categories into the program, second, specifying words that reveal those categories, and third, programming rules that combine the idea categories in order to give a more complex meaning. The authors stress that these three steps "are created and refined by human coders through a series of iterations testing their performance" (Shah et al., 2002, p. 353). The crucial difference to dictionary-based approaches is that this program can set comparatively sophisticated syntactic rules that capture the meaning of sentences. Thus, it is not a mapping of words but an analysis of meaning behind word relationships. As described above, these word relationships are manually created by a human coder in the first step. The study by Shah et al. is quite compelling from a methodological perspective: The authors demonstrate the reliability of their analysis by comparing a randomly selected portion of the sample with the codes of human coders. However, at the same time, there are a few drawbacks. First, all computer-assisted methods premise that a word and a phrase always have exactly one meaning in every context. Although this is certainly a problem of any content analysis, it can be assumed that a human coder is better able to detect these various meanings (Conway, 2006). As Simon (2001) states, "The chief disadvantage is that the computer is simply unable to understand human language in all its richness, complexity, and subtlety as can a human coder" (p. 87). Second, this analysis is limited to electronic text only. Third, studies using this method have not always made entirely clear how the frames were found in the first place. As Conway (p. 196) states, there is no standardized test of intercoder reliability for specifying word indexes or syntactic rules. Again, this increases the risk that the identification of frames falls into a black box. Beside these drawbacks, however, the *syntactical* approach has definitely advanced the coding of media frames.

Deductive approach

All hitherto described methods derive frames inductively. In contrast, there are some deductive studies that theoretically derive frames from the literature and code them in standard content analysis (e.g., Dimitrova, Kaid, Williams, & Trammell, 2005; de Vreese, Peter, & Semetko, 2001; Igartua, Cheng, & Muñiz, 2005; Semetko & Valkenburg, 2000). In a seminal deductive study, Semetko and Valkenburg postulate five generic frames: conflict, human interest, economic consequences, morality, and responsibility. More specifically, each news story was analyzed through a series of 20 questions to which the coder had to answer "yes" or "no." For instance, the economic consequence frame was measured with questions such as "Is there a reference to economic consequences?" (Semetko & Valkenburg, 2000, p. 100). A factor analysis of those 20 items confirmed the postulated frames. Igartua et al. used the five frames identified by Semetko and Valkenburg. However, their factor analysis resulted in six factors as opposed to five. In another study based on Semetko and Valkenburg, Dimitrova et al. coded six predefined frames, which are again different from all other above-mentioned deductive studies. Taken together, there are some limitations of the deductive approach that are worthy of careful consideration. Among these, perhaps the most critical is the crucial prerequisite that the frames are indeed known beforehand and that they suit the topic currently under investigation. In other words, this approach demands a clear idea of the frames likely to be encountered. Hence, deductive studies are limited to already established frames. But, how can we be sure that we do not miss important frames when analyzing an evolving issue? Therefore, this method is quite inflexible when it comes to the identification of newly emerging frames.

In sum, the broad typology of previous methods outlined above offers some insights into the content analysis of media frames. However, we recognize that it has some drawbacks. To begin with, there is some overlap across all five approaches: There are similarities between the manual holistic approach and the hermeneutic approach. Furthermore, almost any framing study uses linguistic devices to measure frames to some extent, although only the linguistic approach offers an extensive description of linguistic elements. Moreover, it can be assumed that many studies apply a subtle mixture of inductive and deductive research strategies. Finally, there are some studies that have combined approaches. For instance, Lind and Salo (2002) not only conducted a deductive frame analysis but also used a dictionary-based method similar to Miller's (1997) frame mapping.

Although all the methods discussed are important milestones for our understanding of what frames are and how they can be measured, they nevertheless appear to demonstrate the frequently repeated criticism that framing research is plagued by some methodological concerns regarding validity and reliability (e.g., Gamson, 1989, p. 159; Miller, 1997, p. 376; Tankard, 2001, p. 104). Some approaches try to capture latent or cultural meanings of a text, which can be problematic in terms of reliability. Other approaches provide sharp and reliable measures but may fall short in terms of validity. Furthermore, a frame is a quite abstract variable that is both hard to identify and hard to code in content analysis (Van Gorp, 2007). As a result, the identification of media frames often falls into a methodological black box (Tankard, 2001). Following Van Gorp, it is often not clear which elements should be present in an article or news story to signify the existence of a frame. This problem is also addressed by Gamson: "We know from years of content analysis that it is difficult, if not impossible, to get adequate reliability with such a genotypic category as a frame" (p. 159). In order to measure a frame in a valid and reliable way, it is therefore important to identify the single elements of a frame. The major aim of this paper is to describe a new method for the measurement of media frames that is based on this premise.

Frames as clusters of frame elements

The basic idea of this procedure can be described as follows. Similar to Miller and colleagues, we understand a frame as a certain pattern in a given text that is composed of several elements. These elements are not words but previously defined components or devices of frames. Rather than directly coding the whole frame, we suggest splitting up the frame into its separate elements, which can quite easily be coded in a content analysis. After this, a cluster analysis of those elements should reveal the frame (Kohring & Matthes, 2002). That means when some elements group together systematically in a specific way, they form a pattern that can be identified across several texts in a sample. We call these patterns frames.

For this method, we first need a frame concept that provides a clear operational definition of frame elements. However, most frame definitions are rather vague and can thus not be directly translated into empirical indicators. For example, Gitlin (1980) defines frames as "principles of selection, emphasis, and presentation composed of little tacit theories about what exists, what happens, and what matters" (p. 6). Gamson and Modigliani (1987) consider frames "a central organizing idea or story line that provides meaning to an unfolding strip of events" (p. 143). Although these definitions are central to the understanding of framing processes, they do not necessarily lead to an applicable operationalization of media frames (Entman, Matthes, & Pellicano, in press). A more detailed and widely accepted definition is offered by Entman (1993, p. 52, original emphasis): "To frame is to *select some aspects of a perceived reality and make them more salient in a communicating context, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation* for the item described." In this definition, several frame elements constitute a frame: a problem definition, a causal interpretation, a moral evaluation, and a treatment recommendation. If these elements are understood as variables, each of them can have several categories in a content analysis. A problem definition can consist of an issue and relevant actors that discuss the problem. A causal interpretation is an attribution of failure or success regarding a specific outcome. An evaluation can be positive, negative, or neutral and can refer to different objects. Finally, a treatment recommendation can include a call for or against a certain action.

Altogether, a frame consists of several frame elements, and each frame element consists of several content analytical variables. As stated above, we assume that some of these different variables systematically group together in a specific way, thereby forming a certain pattern that can be identified across several texts in a sample. These patterns we call frames. In other words, every frame is characterized by a specific pattern of variables. Conceived this way, frames are neither identified beforehand nor directly coded with a single variable. Instead, the variables that signify single frame elements are grouped together by *hierarchical cluster analysis*. The aim of this analysis is the grouping of articles to specific clusters with high differences between the clusters and low differences within a cluster. These clusters will then be interpreted as media frames. One crucial advantage of hierarchical cluster analysis is that its scree test usually provides criteria for how many clusters should be extracted. It is important to note that this method cannot only be applied to the Entman definition but to any operational frame definition that denotes frame elements. The problem reliability in frame analysis is not completely resolved but is shifted to the content analytical assessment of single frame elements. However, the more manifest a certain variable is, the higher is its reliability (Riffe, Lacy, & Fico, 1998, p. 107). Therefore, single frame elements achieve a higher reliability in comparison to abstract, holistic frames. As outlined above, coding holistic frames is one of the major threats to reliability in frame analysis. Another crucial advantage of this method is that coders do not know which frame they are currently coding, as they are not coding frames as single units. Thus, the impact of coder schemata or coding expectations is weaker. Moreover, new emerging frames can be easily detected.

Overall, we assume that our method reveals clusters of articles that share a certain pattern of frame elements (i.e., the variables in content analysis). These clusters are to be interpreted as frames for the given issue. The crucial difference to the common assessment of frames is that frames are empirically determined and not subjectively defined. Moreover, the analysis provides criteria for how many frames can be found in the material. Additionally, we should have the advantage of being able to detect new emerging frames.

The framing of biotechnology in *The New York Times*

In order to demonstrate the usefulness of our proposed method, we have analyzed the framing of biotechnology in one of America's leading and most influential newspapers, *The New York Times*. By comparing two periods of media coverage in *The New York Times*, we sought to discover if and how images of modern biotechnology changed over time. The first analyzed period ranges from 1992 to 1996 and the second from 1997 to 2001. These two phases mark strikingly different debates (Nisbet, Brossard, & Kroepsch, 2003; Priest, 2001). In February 1997, Scottish scientists succeeded in cloning an adult sheep ("Dolly"). From that day on, there has been an increase in the intensity of public debate surrounding biotechnology (Priest, 2001). Overall, the year 1997 marks a clear watershed, which focused public attention on biotechnology as never before (Kohring & Matthes, 2002; Priest, 2001).

As survey research has revealed, U.S. public opinion about biotechnology can be viewed as generally optimistic (Priest, 2001). According to a recent report by the U.S. National Science Foundation (National Science Board, 2004), optimism about biotechnology is actually increasing in the United States. Although it is beyond the scope of this paper to give a comprehensive review of framing effects, it can be said that the mass media has an impact on the public's knowledge about biotechnology (Gaskell & Bauer, 2001). For instance, Ten Eyck (2005) reports a small relationship between media coverage and public opinion about biotechnology.

In sum, we can formulate two research questions. The first one concerns the definition and extraction of frames. More specifically, our aim is to ascertain *whether or not meaningful frames can be empirically determined by a cluster analysis of frame elements*. For the second research question, it can be assumed that *The New York Times* highlights different aspects of the biotechnological field at different times during the debate. Therefore, the analysis will be carried out for two periods of coverage (1992–1996 and 1997–2001). In short, we want to know how our method can extract frames at different times of the debate.

Method

The data for our analysis have been collected as part of the International Research Network "Life Sciences in European Society: Towards the 21st Century" (Gaskell & Bauer, 2001). In this research network, a content analysis of opinion-leading newspapers on the issue biotechnology was conducted in the United States, Canada, and 14 European countries. In this paper, we present the data for the U.S. coverage only. LexisNexis was used to search for the keywords "biotech," "genetic," "genome," and DNA in *The New York Times*. Then, 100 articles for each of the 10 years were randomly chosen for analysis. These 1,000 articles shall serve as a proxy for the media coverage throughout the years 1992–2001 (Ten Eyck & Williment, 2003). The coding was done by two coders. The unit of analysis is the article. Theoretically, the method proposed in this paper can also be used for smaller units such as the paragraph. However, in previous research, frames are most commonly coded per article (Matthes, 2007). The reason may be that this unit is easy to define. The coding frame consisted of registration variables; variables on topics and actors; variables related to risks, benefits, and responsibilities; and evaluations of biotechnology (Gaskell & Bauer, 2001).

As stated above, our aim was to measure media frames on the issue of biotechnology by cluster-analyzing operationally defined frame elements. Table 1 shows the frame elements as defined by Entman (1993) and the corresponding variables in our content analysis. The frame element *problem definition* includes both the central issue under investigation and the most important actor. In our view, these two mark the content of the debate; that is, they define the central problem of a news story. The topic variable consisted of 39 single subtopics on the issue of biotechnology. In fact, these 39 topics were derived from earlier codebooks about biotechnology and from a series of inductive steps. The process of creating codes was guided by the following principles: The codes should be mutually exclusive, exhaustive, and independent. In sum, we believe that these 39 topics mark the entire debate about biotechnology. In a next step, these 39 codes were summarized to nine main topics: Biomedicine, Agri-Food, Cloning, Research, Economics, Moral, Public Opinion, Regulation, and Genetic Identity. As Table 1 demonstrates, the assignment of all codes to the nine main topics is quite unambiguous. This procedure is common in many content analytical studies because it is much easier to analyze nine main issues compared to 39 single topics. All other variables were treated in the same manner. A list of 41 actors was created in precisely the same way as above. Again, this variable was recoded to four main actors: Science, Public Opinion/Media, Business, and Politics. We operationalized the frame element *causal attribution* with variables measuring who was deemed responsible for the risks and benefits of biotechnology. These variables tap the notion that certain actors can be blamed for the risks associated with biotechnological applications, whereas other actors are deemed responsible for possible benefits. The variable has exactly the same codes as the actor variable. However, not all main actors are held responsible for risks and benefits. For instance,

Table 1 Variables and Codes for Cluster Analysis

Frame Element	Variables	Description
Problem definition	Topic: Biomedicine	Gene therapy, diagnosis, predictive medicine
	Topic: Agri-Food	GM food, plant and animal breeding, GMO release, so forth
	Topic: Research	Basic research in genetics
	Topic: Economics	Economic opportunities
	Topic: Cloning	Animal cloning, human cloning, and human organ cloning
	Topic: Moral	Eugenics and ethical issues
	Topic: Public opinion	Public opinion on genetics and biotech, public protest
	Topic: Regulation	Legal regulation, protection of genetic information, so forth
	Topic: Genetic identity	Genetic fingerprinting, screening, inheritance, and insurance
	Actor: Science	Government research institutions, universities, and hospitals
	Actor: Media/public opinion	News media but also the public and public opinion
	Actor: Business	Several business sectors, such as agriculture or industry
	Actor: Politics	Several political sectors, such as parliament, parties, so forth
Causal attribution	Benefit attribution: Science	Science actors are responsible for benefits
	Benefit attribution: Business	Business actors are responsible for benefits
	Benefit attribution: Politics	Politic actors are responsible for benefits
	Risk attribution: Science	Science actors are responsible for risks
	Risk attribution: Business	Business actors are responsible for risks
	Risk attribution: Politics	Politic actors are responsible for risks
Moral evaluation	Benefits: Health	Biotech as a benefit for health
	Benefits: Economic	Biotech as a benefit for economy
	Benefits: Research	Biotech as a benefit for research
	Benefits: Legal	Biotech as a benefit for legal matters
	Benefits: Consumer	Biotech as a benefit for consumers
	Risks: Moral	Biotech as a risk for morality
	Risks: Health	Biotech as a risk for health
Treatment	Judgment: Negative	Biotechnology is negative (i.e., stop it)
	Judgment: Positive	Biotechnology is positive (i.e., do not stop it)

GM, genetically modified; GMO, genetically modified organism.

it simply does not occur in media coverage that the public is held responsible for risks or benefits, but the public can, of course, be a main actor in an article. Hence, many codes of this variable never occurred. This results in a list of only three main actors for benefits and three main actors for risks. Furthermore, we included the most frequent risk and benefit evaluations of biotechnology as these promote a direct (moral) evaluation: Health Benefit, Economic Benefit, Legal Benefit, Consumer Benefit, Research Benefit, Moral Risk, Health Risk, and Economic Risk. Because this study is a secondary analysis, we were not able to directly operationalize the frame element *treatment recommendation*. However, we treat the variables Negative Judgment of Biotechnology and Positive Judgment of Biotechnology as proxies for the treatment recommendation. We assume that whenever biotechnology is judged negatively, this implies a call to stop biotechnological applications. Negative evaluation was measured with a 5-point variable ranging from *slightly critical* to *extremely critical* (and a "not applicable" code). Positive evaluation was measured in the same vein.

We computed binary variables for every original variable. For instance, an original variable with nine categories leads to nine binary "dummy" variables. For statistical reasons, only those binary variables with frequencies higher than 5% were included in the cluster analysis. In terms of cluster analysis, these variables will not contribute to the forming of clusters, simply because they are likely to have a very low frequency in every single cluster. We selected the variables separately for every period. We did this because from 1992 to 1996, there could be other actors, topics, or causal attributions as compared to 1997–2001. In sum, the ingredients that were finally included in our analysis were not arbitrarily chosen. Therefore, we believe that the original list of topics, actors, and the other variables comprised all important categories that were mentioned in media coverage on biotechnology. The final categories for frame analysis were, in fact, empirically determined: Codes that hardly occurred were not included in the cluster analysis.

The coding frame has proved to meet criteria of reliability and validity in several studies. Originally, this codebook was created in 1988. This first application had a reliability (Scott's Pi) of .82 (topics), .84 (actors), .82 (risks), and benefits (.85) (Ruhrmann, 1992, p. 179). However, during its use in international research networks, the codebook has been constantly refined and improved. In its current form, the codebook has been used for content analysis in the United States, Canada, and 14 European countries. However, to establish a reliable codebook that can be applied in several countries is a challenging task. Therefore, a cross-country reliability check was conducted for two randomly chosen English articles. Reliability was measured by the percentage of agreement between coders from 12 countries weighted by the number of categories for each variable. This test reveals an average reliability coefficient of .77 for topics, .78 for actors, .82 for type of benefits, .82 for type of risks, .70 for positive evaluation, and .68 for negative evaluation. For the U.S. coverage, 10 articles were coded by two independent coders. As a result, the average agreement between those two coders for all variables was .80 (Ten Eyck & Williment, 2003). In sum, all variables could be coded with more or less equal reliability.

Results

A hierarchical cluster analysis (Ward method) was carried out for each of the two periods. The Ward method can be considered a good technique for identifying suitable cluster solutions (Breckenridge, 2000, p. 281; for binary variables, see Hands & Everitt, 1987, p. 242). The number of clusters is determined by using the so-called elbow criterion, similar to a scree test in exploratory factor analysis. A clear "elbow" in the plot of the heterogeneity measure signifies that fusing these two clusters would result in a cluster that is too heterogeneous.

Framing biotechnology from 1992 to 1996

For the first period from 1992 to 1996, the heterogeneity measures are as follows: 1,086 (seven clusters), 1,142 (six clusters), 1,201 (five clusters), 1,282 (four clusters), 1,387 (three clusters), 1,597 (two clusters), and 1,959 (one cluster). As can be clearly seen, merging the third cluster with the second (1,597 − 1,387 = 210) results in a too heterogeneous solution. Hence, we can clearly identify three clusters. To check competing solutions, we also tested the interpretability of the five-, four-, and two-cluster solutions. However, the identified three-cluster solution was found to be superior in terms of interpretability and clarity.

Table 2 depicts the mean values of all variables for every cluster. The mean values of binary variables are problematic in statistical terms. However, it alleviates a quick interpretation of our cluster solution. For the interpretation of frames, three things are noteworthy. First, the highest means within one cluster indicate the most important variables. For instance, the topics business and economics signify the facets of biotechnology prevalent in the first frame. Second, rather low mean values within a cluster can also be of significance when it is a high value compared to all other clusters. Third, it is also important to note which variables have low values.

The articles in the biggest cluster, which consists of 38% of *The New York Times* coverage between 1992 and 1996, deal with economic advantages of biotechnology. Within this frame, biotechnology is treated as a progressive technology that promises benefits for the American economy and for the health system. Business actors are deemed responsible for these achievements. There is a clear emphasis on the opportunities provided by these technologies. Risks are not discussed at all, and biotechnology is seen as a positive innovation. We term this frame Economic Prospect. The second frame, Genetic Identity, deals with the political regulation of techniques that allow scientists to read and discover the genetic code of humans, for example, genetic fingerprinting and screening. Whereas politicians are seen as responsible for the risks and benefits associated with this regulation, media/public opinion actors are also among the central players in this frame. Although these articles do mention more benefits than risks, the overall judgment of biotechnology

Table 2 Mean Values and Standard Deviations for Three Identified Frames (1992–1996)

Variables	Economic Prospect (n = 189), M (SD)	Genetic Identity (n = 157), M (SD)	Research Benefit (n = 154), M (SD)
Topic: Biomedicine	0.52 (0.50)	0.21 (0.41)	0.55 (0.50)
Topic: Agri-food	0.23 (0.42)	0.16 (0.37)	0.12 (0.32)
Topic: Research	0.10 (0.30)	0.10 (0.30)	0.51 (0.50)
Topic: Economics	0.77 (0.42)	0.07 (0.26)	0.03 (0.16)
Topic: Moral	0.01 (0.10)	0.07 (0.26)	0.09 (0.29)
Topic: Public opinion/policy	0.04 (0.19)	0.08 (0.27)	0.05 (0.22)
Topic: Regulation	0.20 (0.40)	0.22 (0.42)	0.05 (0.21)
Topic: Genetic identity	0.02 (0.13)	0.44 (0.50)	0.38 (0.49)
Actors: Science	0.01 (0.07)	0.03 (0.16)	0.88 (0.32)
Actors: Politics	0.03 (0.18)	0.44 (0.50)	0.00 (0.00)
Actors: Business	0.92 (0.28)	0.04 (0.19)	0.01 (0.11)
Actors: Media/public opinion	0.01 (0.07)	0.24 (0.43)	0.05 (0.21)
Benefits: Science actors	0.00 (0.00)	0.06 (0.23)	0.86 (0.34)
Benefits: Political actors	0.02 (0.14)	0.38 (0.49)	0.02 (0.14)
Benefits: Business actors	0.75 (0.44)	0.03 (0.16)	0.00 (0.00)
Risks: Science actors	0.00 (0.00)	0.01 (0.08)	0.20 (0.40)
Risks: Political actors	0.01 (0.07)	0.31 (0.46)	0.01 (0.11)
Risks: Business actors	0.31 (0.46)	0.03 (0.18)	0.02 (0.14)
Health benefits	0.40 (0.49)	0.20 (0.40)	0.67 (0.47)
Economic benefits	0.58 (0.49)	0.03 (0.18)	0.02 (0.14)
Research benefits	0.06 (0.24)	0.13 (0.33)	0.44 (0.50)
Legal benefits	0.01 (0.07)	0.17 (0.38)	0.02 (0.14)
Consumer benefits	0.08 (0.28)	0.06 (0.24)	0.05 (0.21)
Moral risks	0.01 (0.10)	0.06 (0.24)	0.09 (0.29)
Health risks	0.09 (0.29)	0.08 (0.27)	0.12 (0.33)
Negative judgment	0.37 (0.48)	0.50 (0.50)	0.34 (0.48)
Positive judgment	0.71 (0.46)	0.58 (0.50)	0.95 (0.21)

is rather controversial. There are both positive and negative judgments. This may be due to the fact that the questions raised in the Genetic Identity frame are usually addressed in the context of potentially disadvantageous implications of modern biotechnology, conveying to the public that biotechnology may encompass unwanted developments. The third frame has been entitled Research Benefit. In this frame, scientists outline benefits for research, especially in the field of biomedicine. These articles focus on the breakthroughs scientists have achieved in this vastly developing research area. The frame is especially enthusiastic about research and health benefits; risks are not discussed at all. The evaluation of biotechnology is positive.

Framing biotechnology from 1997 to 2001

For this period, a six-cluster solution was achieved. The heterogeneity measures are as follows: 974 (eight clusters), 1,012 (seven clusters), 1,052 (six clusters), 1,121 (five clusters), 1,193 (four clusters), and 1,288 (three clusters). Merging the sixth cluster with the fifth would result in a too heterogeneous solution. Additionally, calculating three to seven cluster solutions yields no better result in terms of plausibility and interpretability. Table 3 depicts the mean values for all six clusters. It is important to note that some variables differ in comparison to the first period. This is due to the fact that we included those variables in the cluster analysis that had frequencies higher than 5%. For instance, the issue cloning hardly occurred in the first period but does, of course, occur after *Dolly* was born in 1997.

The first frame, Economic Prospect, is precisely the same as in the first period. However, it is interesting to note that although being the biggest cluster from 1992 to 1996, it is now one of the smallest (11.2%). The second frame, with a portion of 13%, is somehow related to the first. In contrast to the Economic Prospect frame, this frame mainly focuses on the prospects in the field of biomedicine. Therefore, we call this frame Biomedical Prospects. Health benefits are more central than economic matters here. Surprisingly, scientists are not deemed responsible for these health benefits—business actors are. Although the overall judgment of biotechnology is clearly positive, some health risks are also outlined, and regulative issues are addressed in some articles. Again, the third frame is Research Benefit (13.4%), which was also prevalent in 1992–1996. It is clearly dominated by scientists who underline the scientific benefits of basic research in that area. Interestingly, contrary to the first period, some moral concerns and even some possible health risks are faintly mentioned. Nevertheless, the overall evaluation of biotechnological applications within the field of biomedicine was and still is quite positive. The fourth frame is one that had also been established in the first period of media coverage. This is the Genetic Identity frame, which is now one of the most important frames and encompasses 24.2% of the whole media coverage.

One crucial feature that distinguishes the debates of the two periods is the emergence of a new frame that deals with agricultural applications of biotechnology. Articles in this frame stress the advantages and disadvantages of agricultural applications of modern biotechnology, including genetically modified (GM) food. As GM products hit the U.S. market, the debates on risk and safety moved into the public domain. This is the only negative frame throughout all 10 years analyzed. Whereas benefits were not mentioned, health risks appeared in these stories. We called this cluster "Agri-Food: Pros & Cons." This conflict frame expresses the ambiguity and perceived uncertainty regarding further developments and decisions in that area of biotechnology, which is often called green biotech as opposed to red biotech (biomedicine). Finally, a lion's share of all articles (25%) can be attributed to the Biomedical Research frame. However, this cluster is a bit difficult to interpret as there are no causal attributions and hardly any moral evaluations. Several other issues such as cloning, morality, or regulation are also raised here, and we can find scientific, political, and media/public opinion actors. Health benefits are mentioned as rarely as

Table 3 Mean Values and Standard Deviations for Six Identified Frames (1997–2001)

Variables	Economic Prospect (n = 56), M (SD)	Biomedical Prospects (n = 65), M (SD)	Research Benefit (n = 67), M (SD)	Genetic Identity (n = 121), M (SD)	Agri-Food (n = 66), M (SD)	Biomedical Research (n = 125), M (SD)
Topic: Biomedicine	0.45 (0.50)	0.95 (0.21)	0.64 (0.48)	0.03 (0.18)	0.03 (0.17)	0.55 (0.50)
Topic: Agri-Food	0.21 (0.41)	0.05 (0.21)	0.07 (0.26)	0.02 (0.13)	0.92 (0.27)	0.02 (0.15)
Topic: Cloning	0.00 (0.00)	0.05 (0.21)	0.13 (0.34)	0.00 (0.00)	0.02 (0.12)	0.16 (0.37)
Topic: Research	0.00 (0.00)	0.11 (0.31)	0.36 (0.48)	0.07 (0.26)	0.00 (0.00)	0.22 (0.41)
Topic: Economics	0.98 (0.13)	0.51 (0.50)	0.09 (0.29)	0.02 (0.16)	0.03 (0.17)	0.05 (0.21)
Topic: Moral	0.02 (0.13)	0.02 (0.12)	0.15 (0.36)	0.01 (0.09)	0.03 (0.17)	0.10 (0.31)
Topic: Public opinion	0.00 (0.00)	0.06 (0.24)	0.07 (0.26)	0.01 (0.09)	0.35 (0.48)	0.10 (0.31)
Topic: Regulation	0.02 (0.13)	0.31 (0.47)	0.10 (0.31)	0.11 (0.31)	0.18 (0.39)	0.14 (0.35)
Topic: Genetic identity	0.02 (0.13)	0.03 (0.17)	0.24 (0.43)	0.83 (0.38)	0.00 (0.00)	0.13 (0.34)
Actors: Science	0.00 (0.00)	0.00 (0.00)	0.84 (0.37)	0.07 (0.25)	0.17 (0.38)	0.19 (0.40)
Actors: Politics	0.00 (0.00)	0.05 (0.21)	0.03 (0.17)	0.45 (0.50)	0.12 (0.33)	0.10 (0.31)
Actors: Business	0.88 (0.33)	0.92 (0.27)	0.03 (0.17)	0.00 (0.00)	0.39 (0.49)	0.08 (0.27)
Actors: Media/public opinion	0.02 (0.13)	0.02 (0.12)	0.01 (0.12)	0.13 (0.34)	0.08 (0.27)	0.13 (0.34)
Benefits: Science actors	0.00 (0.00)	0.00 (0.00)	0.97 (0.17)	0.00 (0.00)	0.05 (0.21)	0.03 (0.18)
Benefits: Politic actors	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.18 (0.39)	0.00 (0.00)	0.06 (0.25)
Benefits: Business actors	0.25 (0.44)	1.00 (0.00)	0.00 (0.00)	0.02 (0.13)	0.15 (0.36)	0.03 (0.18)
Risks: Science actors	0.00 (0.00)	0.00 (0.00)	0.33 (0.47)	0.00 (0.00)	0.02 (0.12)	0.03 (0.18)
Risks: Business actors	0.07 (0.26)	0.38 (0.49)	0.04 (0.21)	0.00 (0.00)	0.30 (0.46)	0.02 (0.15)
Health benefits	0.02 (0.13)	0.92 (0.27)	0.81 (0.40)	0.02 (0.16)	0.03 (0.17)	0.23 (0.42)
Economic benefits	0.27 (0.45)	0.29 (0.46)	0.07 (0.26)	0.00 (0.00)	0.03 (0.17)	0.01 (0.09)
Research benefits	0.02 (0.13)	0.15 (0.36)	0.21 (0.41)	0.00 (0.00)	0.02 (0.12)	0.02 (0.15)
Legal benefits	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.24 (0.43)	0.00 (0.00)	0.00 (0.00)

(continued)

Table 3 *Continued*

Variables	Economic Prospect ($n = 56$), *M* (*SD*)	Biomedical Prospects ($n = 65$), *M* (*SD*)	Research Benefit ($n = 67$), *M* (*SD*)	Genetic Identity ($n = 121$), *M* (*SD*)	Agri-Food ($n = 66$), *M* (*SD*)	Biomedical Research ($n = 125$), *M* (*SD*)
Moral risks	0.00 (0.00)	0.06 (0.24)	0.13 (0.34)	0.02 (0.13)	0.03 (0.17)	0.09 (0.28)
Health risks	0.00 (0.00)	0.25 (0.43)	0.27 (0.45)	0.01 (0.09)	0.21 (0.41)	0.13 (0.34)
Negative judgment	0.18 (0.39)	0.46 (0.50)	0.52 (0.50)	0.13 (0.34)	0.70 (0.46)	0.39 (0.49)
Positive judgment	0.55 (0.50)	0.95 (0.21)	1.00 (0.00)	0.37 (0.49)	0.53 (0.50)	0.46 (0.50)

are health risks. The overall judgment is neither clearly positive nor clearly negative. Further analysis revealed that articles within this frame are rather small in size, focusing on national or local news. This more or less neutral frame includes factual coverage without mentioning benefits and risks.

Altogether, there are different ways of looking at biotechnological applications at different times in the debate. From 1992 to 1996, *The New York Times* painted a bright picture of this technology stressing economic prospects and health benefits. Here, we find three frames, Economic Prospect, Genetic Identity, and Research Benefit. Throughout these years, the coverage was clearly dominated by red biotechnology, as there is no frame dealing with agricultural applications. In contrast, media coverage became much more specific from 1997 to 2001, which is depicted in the increase of the number of frames and the more differentiated discussion of benefits and risks. In addition to the three frames already mentioned, we had three new frames emerge, Biomedical Prospects, Biomedical Research, and Agri-Food: Pros & Cons. The latter frame demonstrates that biotechnology applied to agriculture and food issues is very likely to be evaluated critically, whereas red biotechnology, such as medical applications, meets with much more enthusiasm. Although other frames still provide information on the positive qualities of biotechnology in that period, the results seem to echo the practices of *The New York Times* to bring more attention to negative aspects. It is also important to note that from 1997 to 2001, no less than three of the six clusters deal with biomedicine. This leads us to conclude that at the dawning of the new century, the framing of biotechnology was dominated by red biotechnology, stressing the usefulness of research in that area.

Discussion

Many scholars have pointed to threats to reliability and validity in frame analysis. To reflect these concerns, this investigation hopes to make a methodological contribution by introducing an alternative approach for the content analysis of media frames. Drawing on the widely accepted definition of frames by Entman (1993), we posit that single frame elements group together in a systematic way, thereby forming unique patterns. When these patterns occur in several articles, we interpret them as frames.

Compared to the hermeneutic, the syntactic, and the manual holistic approaches, our method is more reliable because single frame elements can be more reliably coded than holistic, abstract frames. Nevertheless, one could argue that only a holistic coding can reveal the true essence of a frame because a frame might be more than the sum of its parts. However, this would imply that only the researcher could set these parts together in order to interpret the frame. But because it is difficult to establish reliability for such abstract variables, there is a risk that researchers differ in how they set those parts together. We believe that a frame is, in fact, the sum of its parts—that is, a sum of frame elements. If there is anything beyond these frame elements that signifies a frame, we have to make it explicit in frame analysis. Otherwise, we cannot measure it. Beside this increased precision in measurement, however, there is still room for interpretation because the researchers have to make sense of the clusters that are found.

The method is more valid for two reasons. First, operationally defining the elements that constitute a frame should lead to a deeper understanding of what is really measured. In fact, the operationalization of the frame is completely tied to its theoretical definition, and it is quite easy to find different frames in different phases of media coverage. Second, the crucial advantage of our method is that frames are not subjectively determined but empirically suggested by an inductive clustering method. Moreover, cluster analysis offers criteria for the number of frames. Last but not least, we posit that this method makes the identification of new frames easier because the influence of coder schemata decreases.

This is not to say that other approaches are not able to discover and code frames in a valid way. Other methods can, of course, extract frames in a sound manner. A hermeneutic frame analysis can be convincingly conducted, explaining the steps to generate the frames. Likewise, studies within the manual holistic approach can work with sound coding matrices. However, the general risk of extracting researcher frames instead of media frames should be smaller when clustering single, previously defined frame elements. We also believe that our method has advantages compared to the computer-assisted and the deductive approaches. The deductive coding of frames can be valid depending on how the frames are defined and how they are theoretically derived. However, this method is limited to already existing frames and therefore unable to observe how the framing of an issue changes in different periods of time. The computer-assisted approach has some great benefits as it can be applied to large amounts of text. However, this procedure is still not fully able to understand language in all its richness. In contrast, when a human coder analyzes frame elements, she or he is of course able to analyze language with all its nuances and ambiguities. Another potential drawback of the computer-assisted approach is that some words need not occur very often in spite of being central to the meaning of the text. For instance, the word “Frankenstein” is rarely used in the coverage about biotechnology. This word signifies some kind of doom scenario; thus, it is quite important for the interpretation of the article. A human coder would understand the meaning of Frankenstein in the context of biotechnology, whereas computer-assisted content analysis probably would not. One could argue that the exclusion of infrequent categories in our study poses a similar problem to cluster analysis. However, the exclusion of infrequent variables is no serious threat for the cluster algorithm because infrequent variables do not contribute to the formation of clusters.

Taken together, we believe that our method combines the advantages of manual coding with the advantages of computerized analysis: The coding of frame elements is conducted manually, but the challenging task of identifying abstract, overarching patterns is done by the computer. Still, the cluster/frame is finally interpreted and contextualized by the researcher. The results revealed clear evidence for this line of reasoning. We produced good cluster solutions for the two analyzed periods. From a methodological point of view, identifying precisely the same clusters in different samples (i.e., different periods of media coverage) can be considered a validation. This seems to address the demand frequently repeated in the methodological literature that every cluster solution should be tested with independent samples (e.g., Breckenridge, 2000). However, there are also some shortcomings in our data. Unfortunately, we were not able to fully portray all frame elements. This is because we had to rely on already existing data that were originally not made for such an analysis. Therefore, continued research that theoretically specifies all frame elements and their constituting variables is warranted. In addition, our clustering approach is suitable to any frame definition that specifies single frame elements. As another shortcoming, our sample was limited to newspaper coverage. However, our clustering approach can also be applied to the analysis of television coverage when the frame elements are coded accordingly. Finally, we had to treat the article as the unit of analysis. From a theoretical perspective, it seems more reasonable that there can be several frames in a single news item. Frames can be understood as strategic views on issues put forth by actors. Thus, there can be different frames in a single article (Matthes, 2007). This view is consistent with the journalistic understanding of news diversity.

In sum, we hope that our method is a step toward improving the reliability and validity of frame analysis. However, there are some liabilities as well. First, the unreliability of manual coding will always remain a problem. Although we have argued that the coding of frame elements is more reliable than the coding of abstract frames, reliability can, of course, not be guaranteed. As with any manual content analysis, sound codebooks and solid coder training are still necessary. Second, our method adds complexity to frame analysis as it introduces a clustering procedure instead of directly coding frames. A third potential criticism might be that it can hardly be applied to very large amounts of texts because it builds on manual content analysis. For such an endeavor, computer-assisted methods demonstrated in Shah et al. (2002) offer very promising possibilities. The fourth liability is that problems may occur when conducting a cluster analysis of frame elements. For instance, it is unlikely to find meaningful clusters when including too many variables. In addition to that, the elbow criterion does not always lead to a clear decision regarding the number of clusters. However, some of the shortcomings of cluster analysis can be avoided by using latent class analysis (Magidson & Vermunt, 2001). Applying latent class analysis to cluster theoretically defined frame elements and combining these data with audience frames in an advanced methodological design is a fertile topic for future research.

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L'analyse de contenu des cadres médiatiques : vers une amélioration de la fiabilité et de la validité

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Résumé

L'objectif principal de cette étude est de mettre en lumière des problèmes méthodologiques de l'analyse de contenu des cadres médiatiques. Après un survol de cinq méthodes courantes, nous présenterons une procédure alternative qui vise à améliorer la fiabilité et la validité. Nous basant sur la définition des cadres d'Entman (1993), nous proposons que des éléments de cadrage précédemment définis se regroupent systématiquement d'une manière spécifique. Cette configuration d'éléments de cadrage peut être identifiée à travers plusieurs textes grâce à une analyse typologique. La méthode proposée est démontrée avec l'analyse de données tirées de la couverture de la biotechnologie dans le *New York Times*. Nous conclusions que la méthode proposée entraîne de meilleurs résultats en termes de fiabilité et de validité, en comparaison aux méthodes précédentes.

Die Inhaltsanalyse von Medien-Frames: Verbesserung von Reliabilität und Validität

Das Hauptanliegen dieser Studie war es, die methodologischen Probleme bei der Inhaltsanalyse von Medien-Frames zu beleuchten. Im Anschluss an den kritischen Überblick über fünf übliche Methoden, präsentieren wir eine alternative Prozedur die darauf abzielt, Reliabilität und Validität zu verbessern. Basierend auf einer Definition von Frames in Anlehnung an Entman (1993), schlagen wir vor, dass vorher definierte Frame-Elemente sich auf eine bestimmte Art und Weise systematisch gruppieren. Dieses Muster der Frame-Elemente kann über verschiedene Texte mittels Clusteranalyse identifiziert werden. Die vorgeschlagene Methode wird anhand von Daten zur Biotechnologie-Berichterstattung in der *New York Times* dargestellt. Es wird zusammengefasst, dass die hier vorgeschlagene Methode mit Hinblick auf Reliabilität und Validität bessere Ergebnisse hervorbringt als andere Methoden.

El Análisis de Contenido de los Encuadres de los Medios: Hacia una Mejora de la Fiabilidad y la Validez

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Resumen

El propósito principal de este estudio es brindar luz sobre los problemas metodológicos en el análisis de contenido de los Encuadres de los Medios. Después de revisar 5 métodos comunes, presentaremos un procedimiento alternativo que apunta a mejorar la fiabilidad y la validez. Basados en la definición de los encuadres ofrecida por Entman (1993), proponemos que los elementos del encuadre previamente definidos sean agrupados juntos de una manera específica. Esta pauta de los elementos del encuadre pueden ser definidos a través de varios textos por medio de un análisis de grupo. El método propuesto es demostrado con datos sobre la cobertura de un asunto de biotecnología en la *New York Times*. Se concluye que el método propuesto produce resultados mejores en términos de fiabilidad y validez comparados con métodos previos.

媒介框架的内容分析：提高可信度和有效性

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本研究的主要目的是分析媒介框架之内容分析的方法问题。在评估 5 种通用方法之后，我们将展示一个旨在提高可信度和有效性的替代性方案。在 Entman (1993) 所提出的框架概念基础上，我们提议先前界定的框架因素以一种特定方式有系统地聚合在一起。这种框架因素模式可通过聚集分析的方式、横跨几个文本加以界定。我们用《纽约时报》有关生物技术的报道的数据来支持上述提议。本文总结认为，所提议的方法比之以前的方法能带来更高程度的可信度和有效性。

미디어 프레임의 내용분석: 신뢰도와 유효성 향상을 위한 연구

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요약

본 연구의 주 목적은 미디어 프레임의 내용분석에 있어서 방법론적 문제점들에 대한 해결책을 찾기위한 것이다. 다섯가지 일반적 방법론들에 대한 분석후, 우리는 신뢰도와 유효성을 향상시기키 위하여 대안적인 과정을 제시하였다. Entman (1993)에 위해 진전된 프레임들의 정의에 근거, 우리는 이전에 정의된 프레임 요소들을 체계적으로 특정한 방법에 의해 함께 묶을 것을 제안한다. 프레임 요소들의 이러한 형태는 군집분석에 의해 확인될 수 있다. 새로 제안된 방법은 *New York Times* 에서 생물공학 이슈의 보도를 위하여 자료와 함께 설명되었다. 본 연구는 제안된 방법이 기존의 방법론들과 비교하여 신뢰도와 유효성이라는 관점에서 더 좋은 결과를 산출한다고 결론짓고 있다.