

Whom to Trust with Genes on the Menu?

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Food is something very special in our lives. This is not only and exclusively eating, calories and market. In the case of food, we have also to take into account the cultural aspects such as religion and tradition. For example, people were and still are told by religious authorities to eat only fish on Friday or to avoid pork. More recently, in the European Union (EU) we have witnessed a novel tendency: slow food. This new trend re-evaluates eating as having a social value. However, the case of authority has changed: whereas the evaluation of food is still dependent on cultural aspects, people now have to consider what scientific authorities tell them about the health consequences of food. For example, fat has been identified as a serious cause of heart diseases, and there are many other warnings that people were never concerned about in former times. Throughout the past decade, we have observed a new development on the food market: genetically modified (GM) food. Since people cannot directly smell and taste the genetic modification, that is, they cannot distinguish between a genetically modified and a 'normal' tomato, they are even more dependent on experts. The question of how non-experts can acquire knowledge to inform their own decisions about GM food leads to the crucial problem of trust in information sources.

The aim of the study reported in this chapter is twofold: first, we outline a theoretical concept which combines a modern sociological view of trust in information sources with social psychological considerations of how people process information when developing attitudes. Second, we try to test some initial predictions drawn from our model by analysing the effects of trust in information sources on attitudes towards GM food. Since most people inform themselves via newspapers and television, we focus on journalism as a source of information. First, we deal with the public perception of GM food. Then we describe our

concept of trust and especially what trust in journalism refers to. In the next section, we introduce the heuristic systematic model that describes how people form attitudinal judgements and react to new information. From there, we derive our hypothesis that the impact of source trustworthiness on attitudes towards GM food should be higher if people's confidence in their own judgement is low than when it is high. We conducted two experiments in Germany and Sweden with a total of 224 individuals. Our data show that our hypothesis could not be confirmed, but nevertheless reveal interesting insights. The consequences of these results for future research are discussed in the last section.

The public perception of GM food

Several studies of public perception of gene technology conducted during the 1990s show that the European public is quite sceptical towards food applications of gene technology (Bauer and Gaskell, 2002; Gaskell and Bauer, 2001; Durant et al, 1998). Studies also show that in the US people are less concerned about gene technology compared to people in Europe (Gaskell and Bauer, 2001). In the late 1990s, this starts to change and the US is closing in on Europe when it comes to scepticism towards the technology (Hornig Priest, 2000). The study by Hornig Priest indicates that the US public has quite stable and negative opinions about GM food, but compared to other kinds of food concerns (e.g. diseases from animals that can pass to humans) GM food is the least controversial food concern. However, in a student survey comparing the US, Japan, Norway and Taiwan, the US public is still the most positive towards consuming GM food (Cher and Rickertson, 2002; Bauer and Gaskell, 2002).

Perceived risks and benefits seem to be important when it comes to acceptance of GM food. When information consisting exclusively of the benefits is given to respondents, this results in more favourable attitudes, but even when both risks and benefits are mentioned, the benefits concerning environment, taste and health make people more positive to GM food (Frewer et al, 1996; Frewer et al, 1997; Hamstra, 1998; Hoban, 1998). However, benefits perceived as only favouring producers have a negative impact on public acceptance, and products associated with risks especially for the environment and physical illness are not accepted to the same extent as benefits to the consumer (Frewer et al, 1996; Hamstra, 1998). This is confirmed in an opinion study that shows that people so far do not see any consumer advantages with GM food products; moreover, the benefits of GM food are believed to remain solely with the industry (Alvensleben, 2001).

Whether attitudes to genetic engineering and food in general influence people's perception of GM food is rather unclear. Some studies suggest that attitudes to genetic engineering in general are an important determinant (Frewer et al, 1997), while other results show that general attitudes towards food production, nature and genetic engineering contribute only marginally to the evaluation of GM products (Hamstra, 1998).

Earlier studies also show that the evaluation of GM food differs between different types of applications. Transgenetic animals are accepted to a lesser extent

than plants and micro-organisms, which are more widely accepted (e.g. Gaskell and Bauer, 2001; Durant et al, 1998; Hamstra, 1998; Hampel et al, 2000; Urban and Pfenning, 2000). It is important to note, however, that the biggest difference is not between different kinds of GM food applications, but rather between GM food and other applications of gene technology, for example medical applications (Gaskell and Bauer, 2001; Bauer and Gaskell, 2002; Durant et al, 1998; Hampel et al, 2000). Moral values and beliefs about nature also play a role in the evaluation of GM food. When GM food is perceived as unnatural or immoral, acceptance is low (e.g. Frewer et al, 1996; Hamstra, 1998; Hoban, 1998).

Between 1998 and 2000, a large number of focus group interviews on agricultural biotechnology were conducted in five European countries (Marris et al, 2001). The study is critical of earlier studies and rejects several of the findings discussed above as well as a number of what the authors frame as 'myths' about lay people's ideas concerning agricultural biotechnology. The authors state that such myths consist of the belief that there is a lack of knowledge among the general public, that the media influence public perceptions, that there is a difference in judgement regarding medical and agricultural applications of gene technology, and that there are differences in public perception between countries. According to the study, there are great similarities across countries, different groups and over time, and these similarities are based on salient dimensions of experience of ordinary people. This similarity is seen as evidence of the lack of media effects since media coverage differs between countries, and instead the authors emphasize the existence of commonly shared salient dimensions of the experience of ordinary people. They also put forward the idea that the shared character of public responses across countries represents the emergency of a common European public culture on scientific and technology trajectories.

Altogether, the empirical research shows that there is no single perception of 'the' GM food. Instead, evaluations differ from application to application and from institutional actor to institutional actor. For non-experts or so-called lay people, the situation is characterized by two aspects: the perception of social conflicts about GM food and the lack of direct experience. Both aspects lead to the question of how non-experts can acquire knowledge and form evaluations in order to decide about GM food-related topics in everyday life. Since they will use non-direct experiences if they decide to actively participate in decision processes concerning GM food (on whatever level of action), the crucial problem for them is that of trust in information sources.

Trust in information sources

The concept of trust

Scholars dealing with trust underline the fact that the concept of trust is directly linked to the concept of risk (Luhmann, 1979; Coleman, 1990; Giddens, 1990; Hardin, 2002). A risky situation denotes a possible benefit but at the same time a possible loss. Another crucial character of trust is the lack of knowledge or control. As the German sociologist Georg Simmel puts it, 'trust – the hypothesis about

the future action of the other – is a medium state between knowledge and non-knowledge. A person with total knowledge does not need to trust whereas a person without any knowledge at all cannot trust' (Simmel, 1964, p38; Lewis and Weigert, 1985a). This quotation underlines another important feature of trust, its reference to future situations. Altogether one can say that trust is addressed to another social actor, that it expresses an expectation towards this actor which refers to a future action of this actor, that it is characterized by insufficient knowledge about the outcome of this future action and that it therefore includes the awareness of a certain risk.

The aspects of an open future and a perceived risk are decisive for trust situations. In other words, when there is nothing at stake, trust is not needed. A situation is risky because it and particularly the other actors involved are uncontrollable. For example, in the case of GM food the control of the safety and also the judgement of benefits are definitely not in the hands of the consumer. Modern societies are characterized by autonomous expert systems (Giddens, 1990), each with its own organizational structure, specialist language and logic of action. An individual is not able to control the effectiveness of these systems and their actors on his or her own, due to a lack of knowledge and insufficient other resources, like money and time.

The function of trust is therefore to anticipate the future: the consumer replaces the missing information by trust in order to tolerate the perceived uncertainty of the situation (Luhmann, 1979, 1988; Lewis and Weigert, 1985a, b; Earle and Cvetkovich, 1995; Seligman, 1997). The so-called trustee (i.e. the one who trusts) makes use of a piece of information or a judgement by another person in order to continue his/her own social acting. A trust action denotes the selective linking of others' actions with one's own actions at times when there is a concern about the uncertainty of the outcome (Kohring, 2001, 2003). The crucial point is that in the moment of decision (to eat a GM apple, to form and utter an attitude), this adoption is not based on situation-specific knowledge. Because trust is not based on situation-specific arguments or knowledge, most indicators for trust are symbolic – they are taken as a sign for trust (for instance, the taste of the apple mentioned above). Since in modern societies, even in the field of one's own expertise, no one knows everything, trust has become an eminent mechanism in social life (and trustworthiness an indispensable resource). Trust allows people to widely broaden their possibilities of social action, 'simply' by replacing information with trust. The alternative would be a time-consuming control of the situation or an overall withdrawal from any action. It is important to note that, in our understanding, trust refers to expectations towards social actors and not to technological products, as for example food itself. To trust in things is a form of self-confidence. In this chapter, we are interested in the role that social trust relations, for example in specific information sources, play in the acceptance of information about GM food.

Now it becomes clear why today trust in information sources is more important than the approach of exerting control via the transmission of knowledge. The traditional view of the role of knowledge is that people would not accept biotechnology because of a deficit in knowledge. The 'therapy' then would be

to provide people with more scientific or technological knowledge in order to heighten acceptance of biotechnology. But research has shown that it is not necessarily the case that people object to biotechnology because they are ignorant or uneducated (Midden et al, 2002). They may protest because of other reasons, and often experts themselves are critical of certain applications of a technology. The so-called deficit model of public understanding of science and technology ignores the fact that acceptance is a matter not merely of knowledge but of external evaluations regarding, for example, usefulness, political participation and ethics. But even if technological knowledge really did govern acceptance, the idea of transferring knowledge to 'lay people' would be a hopeless task, simply because people lack sufficient resources such as time, money and cognitive resources to receive and adopt the information. This overwhelming complexity is among other things reduced by trust, or alternatively distrust. Therefore, at least in modern western societies, trust is perhaps the most important key to the relationship between science, technology and the public. GM food is the most controversial among the applications surveyed in the Eurobarometers 1996, 1999 and 2002 (Gaskell et al, 2002), and it is the aspect of trust rather than knowledge that explains the encouragement of biotechnology.

Trust in journalism as an information source

Regarding trust in journalism, we draw on recent efforts in theory development and scale construction that are beyond the scope of this chapter (see Kohring 2001, 2003; Matthes and Kohring 2003). At the most general level, this work suggests that for almost all people the journalistic information in newspapers, television, radio and also the internet offers almost the only possibility to acquire knowledge, to consider several aspects of GM food and to form judgements and evaluations. Therefore the question of trust in journalism (trust in 'media' would be a less exact term, because advertising, public relations and entertainment is not meant here) is very important for the perception of GM food. The concept of journalistic selectivity is crucial for the issue of trust in journalism. Journalistic selectivity refers to the process of informing the journalistic publics about events in society which are of possible relevance to them. Four interdependent dimensions or factors of trust in journalism can be distinguished:

- 1 Trust in 'theme selectivity' means the selection of themes or subjects for coverage.
- 2 Trust in 'fact selectivity' refers to the selection of further information which contextualizes the already selected theme.
- 3 Trust in the 'correctness of descriptions' refers to the verifiable correctness of information (= credibility or believability).
- 4 Trust in 'explicit evaluations' refers to the explicit weighing of themes and information.

Taken together, journalism can be regarded as the crucial source of information about social and political life. Its societal function consists of selecting and

conveying information about the complex interdependencies of modern society. Doing so, journalism enables social actors (personal and organizational) to orient themselves to their social environment(s) and to adjust their expectations regarding other social actors. Trust in journalism as an information source is therefore a necessary condition for trust in other social actors. Therefore, trust in social actors such as those in the field of GM food (industry, distributors, farmers, consumer organizations, politicians, Greenpeace and so on) is dependent on the degree of trust that people are willing to grant to journalistic organizations such as newspapers or radio stations. This is also true for the development and change of attitudes towards GM products, which is the main focus of this chapter.

The formation of attitudes on GM food

From the long history of research on persuasive communication we know that one of the factors influencing the persuasive impact of a message is the trustworthiness and credibility of the message source (see, for example, Hovland et al, 1953; Petty and Wegener, 1998). Within the framework offered by the elaboration likelihood model (ELM), the trustworthiness of a message source has predominantly or perhaps even exclusively been studied as a peripheral cue that allows for attitude formation without much effort (Petty and Wegener, 1999). This research has shown that attitudes are influenced more strongly by the trustworthiness of a source (or related source characteristics such as source expertise) under conditions of low elaboration likelihood than under conditions of high elaboration likelihood (Petty and Cacioppo, 1985). In the latter case, attitudes are influenced more strongly by what the source actually has to say or, in other words, the source's viewpoint and argumentation. The results of this research suggest that attitudes are based either on source trustworthiness or some other peripheral cue, or on arguments. In order to develop a comprehensive understanding of the role of trust in persuasion, we draw on the heuristic systematic model (HSM) by Chaiken (see, for example, Eagly and Chaiken, 1993, 1998; Chen and Chaiken, 1999), which provides a more clearly specified dual-processing approach.

The HSM on persuasion and attitude change describes how people form attitudinal judgements and react to new information. The HSM was developed to apply to validity-seeking persuasion settings in which people's primary motivational concern is to attain accurate attitudes that square with relevant facts. The model postulates that this goal can be achieved through two types of information processing, namely *heuristic processing* and *systematic processing*. Systematic processing (SP) refers to a comprehensive, analytic type of processing in which a person scrutinizes a great deal of relevant information. It also involves argumentation in a message being evaluated and related to other available information. This mode demands that a person has both the capacity to process information and the motivation to do so. The second mode, heuristic processing (HP), is conceptualized as a more limited mode of information processing that requires less cognitive effort and fewer cognitive resources. In this mode, people focus on simple decision rules, cognitive heuristics or schemata to formulate their

judgements and decisions. Examples of heuristics are 'experts can be trusted' or 'consensual judgements can be trusted'. Attitudes based on HP are supposed to be less stable and less resistant to counter-information and less predictable with regard to behaviour than attitudes based on SP.

It is assumed that both processing modes can occur concurrently (Eagly and Chaiken 1993). They may act additively and interdependently. SP can be inhibited because it requires ability and motivation. HP needs at least the presence of heuristic cues and the cognitive availability of their associated heuristics. Finally, if people are unsure whether or not to put effort into forming or changing their views on a particular issue, heuristics may affect judgement by helping them to decide on the level of effort. SP produces a lot of relevant information and may therefore attenuate the effects of HP. However, HP may also act independently on persuasion.

In selecting a processing mode, two main motives exert influence. The first is the *least effort principle*, which asserts that people will prefer less effortful modes to more effortful modes. The second motive is the *sufficiency principle*, which assumes that people are motivated to make the effort that is necessary to accomplish the processing goal. This means that people will pay attention to a message to attain a sufficiently confident assessment of message validity. The sufficiency threshold is defined as the desired level of judgemental confidence that a person aspires to attain in a given judgement setting. It holds, among other things, that a person will stop processing when the sufficiency threshold has been reached. The sufficiency threshold can vary between situations and between persons.

On the basis of the two principles of least effort and sufficiency, we may derive some expectations. In the following, we will present these basic hypotheses and the experimental approach to put them to test. According to the HSM, the impact of any piece of information on attitudes depends on how much confidence a person has in his or her attitude. If a person has sufficient confidence, he or she will not be open to new information and hence it will not be likely that either cues or arguments will have an effect. If a person is insufficiently confident of his or her attitude, he or she will be open to new information and hence it will be more likely that a cue or an argument will affect his or her attitude.

Hence, according to this approach, as self-confidence decreases, the likelihood that source trustworthiness has an impact on attitudes increases in principle. However, the likelihood that arguments have an impact on attitudes increases as well. The fact that under these circumstances often no effect of source trustworthiness on attitudes is observed is explained in terms of the informative value of cues versus arguments. Because cues are usually less informative than arguments, the impact of cues is usually attenuated by the impact of arguments. If this is true, the impact of source trustworthiness on attitudes should be higher in cases of low confidence than in cases of high confidence, provided that no arguments are presented that overrule the cue effect. Consequently, we hypothesize that *the impact of source trustworthiness on attitudes towards genetically modified food is higher in the case of low judgemental confidence compared to high judgemental confidence*. This basic hypothesis was tested in the present experiment. In addition

to this hypothesis, another independent variable was included as a further research question: the valence of the message. In one condition, a source was presented who pleads against GM food and in the other condition the source pleads for GM food. We added this variable in order to explore possible interactions between the perceived trustworthiness of the source and the direction of the evaluation held by the journalist. The judgemental impact of trust as a heuristic cue will become greater when the sufficiency threshold is at a high point, compared to a low point, of the confidence scale. Thus, if there is a serious health risk (negative evaluation of GM food), the perceived trustworthiness of the source could show more effect on attitudes.

Methods

Two experiments (using the same procedure) were conducted, one in Germany and one in Sweden. The participants were told that the study was about product innovations, and then they were asked to take a seat behind a PC and to work through the experiment via a computer program. A total number of 224 persons participated in the experiment, of whom 55 per cent lived in Germany and the other 45 per cent lived in Sweden, and 48 per cent were male and 52 per cent female. The mean age of the sample was $M = 25$ ($SD = 4.79$); the youngest participant was 18, the oldest 46. The participants were students from different departments.

In the experiment, the participants were confronted with a message about a GM apple (there were also information and questions about four other innovations). This message argued either for (risk triggering) or against (risk suppressing) market introduction of the GM apple. The message was given by a source of either high or low trustworthiness, respectively, which gives a two (judgemental confidence: low or high) by two (message direction: pro or con) by two (trustworthiness: low or high) factor between subjects design, with judgemental confidence being a quasi-experimental factor and message direction and trustworthiness being experimental factors. The dependent variable was the attitude towards consuming the apple.

Manipulations

Trustworthiness was manipulated by the information given about the author of the article (see Appendix). Pilot testing made sure that the sources of low and high trustworthiness respectively were consensually regarded as such. The experimental 'message valence' condition was different between the countries: the German participants received a positive message, whereas the Swedish participants received a negative message. The first part of the message was the same for both conditions. In the second part, a position either for or against the apple was presented (see Appendix).

Measures

Attitudes

In the first part of the experiment, attitudes towards five innovative products were measured by means of the question 'How do you feel about yourself using/consuming [the innovative product]?' Answers were given on a seven-point scale. After the introduction of the stimulus material, the attitude towards the GM apple was again measured by a semantic differential of five attitude items (Cronbach's alpha = 0.90). The difference between the two measures was taken as an attitude change variable.

Trust

Mainly based on a theoretically derived trust in media scale which measures the four dimensions of specific journalistic selectivity described above (Kohring 2001; Matthes and Kohring 2003), trust in the information source was assessed by asking participants to indicate the extent to which they agreed with a total of seven statements (see Appendix). Answers were also given on a seven-point scale. Exploratory factor analysis revealed a one-factor solution (eigenvalue = 3.78, explains 53.94 per cent of variance, Cronbach's alpha = 0.85).

Judgemental confidence

Judgemental confidence was measured by two different questions (both were on a seven-point scale; Cronbach's alpha = 0.70):

- 1 'How certain do you feel about your opinion on [the innovative product]?'
- 2 'To what extent do you doubt your opinion on [the innovative product]? [inverse]'

The assignment to the quasi-experimental condition of 'judgemental confidence' was based on a median split on the scale of these items (median = 5) because in several pilot studies the manipulation of judgemental confidence turned out to be unsuccessful.

Table 5.1 shows the number of participants per condition.

Table 5.1 *Number of participants per cell*

		Low JC	High JC
Positive message	Low trust	20	30
	High trust	31	19
Negative message	Low trust	39	22
	High trust	29	34

Results

First of all, an Analysis of Variance (ANOVA) with the manipulation of source trustworthiness as independent variable and trust in information source as dependent variable revealed a significant main effect of source trustworthiness ($F = 14.33$, $p = 0.000$). This means that our manipulation of the trustworthiness of the information source succeeded. Participants who received information that underlined the source's trustworthiness reported a higher level of trust, $M = 3.69$ ($SD = 0.99$), than participants who received information that undermined the source's trustworthiness, $M = 3.19$ ($SD = 0.99$). This allows us to check for the effects of source trustworthiness, judgemental confidence and message valence on attitude change regarding the genetically modified apple. Therefore, an ANOVA was conducted with judgemental confidence, source trustworthiness and message valence as independent variables and the difference between pre- and post-attitude towards consuming the GM apple as dependent variable.

As outlined above, we expected that the impact of source trustworthiness on the attitude change towards the genetically modified apple would be higher in the case of low judgemental confidence compared to high judgemental confidence. Surprisingly, this hypothesis cannot be confirmed: there is no significant interaction between trustworthiness and judgemental confidence. Nevertheless, the data reveal some interesting results. The interaction effect between source trustworthiness and message valence is significant, $F(1, 216) = 3.91$, $p = 0.049$. Tests of the simple effect of source trustworthiness within each level of message valence revealed that source trustworthiness did not affect attitude change in case of the negative message, $F < 1$, n.s., but did affect attitude change in case of the positive message, $F(1, 216) = 3.90$, $p = 0.050$. As can be seen in Table 5.2, the positive message resulted in negative attitude change when source trustworthiness was low and positive attitude change when source trustworthiness was high. In other words, when an incompetent and biased journalist pleads for genetically modified food, he achieves exactly the opposite from what he seems to want (this is a boomerang effect).

Table 5.2 *Effect of source trustworthiness and message valence on attitude change*

	Low source trustworthiness	High source trustworthiness	Row totals
Positive message	-0.24 (1.10)	0.20 (1.07)	-0.02 (1.10)
Negative message	0.02 (1.06)	-0.05 (1.11)	-0.02 (1.08)
Column totals	-0.10 (1.08)	0.06 (1.10)	
	Sample total		-0.02 (1.09)

Note: Table shows the means and standard deviations of the attitude change variable.

In sum, the hypothesized interaction between judgemental confidence and the trustworthiness of the information source cannot be confirmed. One explanation might be that due to the median split procedure the difference between low and high judgemental confidence was not large enough to achieve a difference in attitude change. The direct measure of judgemental confidence led to a slightly skewed distribution as the median of judgemental confidence is 5.00 on a seven-point scale. This calls into question whether we could separate high and low judgemental confidence properly.

Complexities in message reception

In this chapter, we have discussed the role of trust in journalism in the formation of attitudes on GM food. To examine this relationship, we gave a brief overview of empirical studies regarding the public perception of this application. Taken together, these studies indicate that consumers tend to focus on the disadvantages rather than on the benefits of GM food products.

One crucial characteristic of GM food is the fact that most potential consumers have to rely on non-direct experiences to develop their attitudes and to act on GM food-related aspects of social life. Therefore, trust in information sources such as journalism is a key variable when it comes to the acceptance of GM products. We define trust as a mechanism that helps people to reduce the complexity of social life by anticipating future action and tolerating the risk of delegating control. As an information source we chose journalism, which we regard as the most important origin of information for consumers.

The heuristic systematic model (HSM) was used as a conceptual framework in order to derive some initial hypotheses on the role of trust in persuasion processes. Specifically, we argued that the impact of source trustworthiness on attitudes towards genetically modified food should be higher in the case of low judgemental confidence compared to high judgemental confidence. Furthermore, we explored the impact of positive versus negative viewpoints. We found an interaction effect of source trustworthiness with message valence, but, contrary to our assumption, independent of the degree of judgemental confidence. Trustworthiness had an impact on attitude change only when the valence of the message was positive. At first glance, this difference might be interpreted as a cultural effect, that is, the German subjects show a different pattern than do the Swedish. However, the fact that the prior attitudes in both countries were the same speaks against this explanation. This finding can also be explained by reasoning that in this context it is more risky to accept a positive message than it is to accept a negative message. Accepting the positive message means that the participant has to consider actually eating the GM apple and therefore taking the risk of negative health consequences. Contrary to this, accepting the negative message implies that the participant does not consider eating the apple and hence is not taking the risk of any negative consequences. The interaction effect of valence and source trustworthiness occurs because a risky request to act raises the sufficiency threshold, which in turn triggers the processing of trust cues. As previously discussed,

trust is only relevant in situations perceived as risky. This may also explain why a positive message given by an untrustworthy journalist leads to even more negative attitudes towards the GM apple.

These first results point to some unresolved issues, each of which warrants further inquiry for future research. First of all, in the foregoing we treated the two types of information (information about the source trustworthiness and the message as information from the source) as independent sets of trust cues. However, this might be an overly simple impression of the mechanisms involved. Not only is the information *from* the source interpreted in the light of the information *about* the source, as we have already argued, but the information *about* the source is also interpreted in the light of the information *from* the source. This interaction effect means that the message, the acceptance of which should be a function of trust in the information source, itself influences trust in the information source. For example, in the experiments described above, the source was a journalist. Since a journalist is expected to be independent, the journalist may trigger suspicion if he or she presents one-sided information. In our experiments, both the information about the source and the information from the source provided people with multiple cues of the source's trustworthiness. As a consequence, we have to consider the differentiation between trust effect and message effect on attitude formation. Therefore, future research should try to measure the pure effect of trustworthiness manipulation on trust in information sources. The first manipulation check of trustworthiness should be placed before the presentation of the message, and a second one after that. Additionally, since risk perception is a central condition for the relevance of trust, we should directly measure risk perception and risk acceptance.

Altogether, the results of this study have clearly underlined the relevance of trust in information sources regarding risky future decisions in which people can only act when delegating control to other social actors. An obvious indicator for this relevance is our observation that a positive message uttered by an untrustworthy source leads to negative attitude changes. Furthermore, it is also crucial to study the conditions under which this key resource of modern societies evolves. In this respect, we have learned that the case is even more complex than we could have anticipated.

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Appendix

Trust items

- 1 'I have the impression that this journalist usually writes about topics that have my interest.'
- 2 'I have the impression this journalist usually tells the truth.'
- 3 'I have the impression this journalist usually makes proper judgements.'
- 4 'I have the impression this journalist usually looks at an issue from various perspectives.'
- 5 'I have the impression this journalist is trustworthy.'
- 6 'I have the impression this journalist is competent on the issue of biotechnology.'
- 7 'I have the impression this journalist only wants the best for his readers.'

Manipulation of source trustworthiness

Low trustworthiness

The author of this article is working as a trainee journalist for a small local newspaper. Mainly he writes about sports and entertainment. As a second job, he

works for a local biotechnology firm doing layout work. He wrote the following article because a colleague became ill and he had to cover the science news at short notice.

High trustworthiness

The author of this article is an experienced science editor for an important national newspaper. For his critical background coverage of the BSE crisis, he received the prestigious 'Media Award for Consumer Protection'. For the following article, the author has looked in depth at the issue of biotechnology – for example by visiting conferences.

Manipulation of message valence

First part for both conditions

Is the consumer ready for the techno-apple?

Everyone knows the apple, this tasty fruit from a family with more than 25 varieties. Apples can be bought at every supermarket and every local market. Usually the consumer has the choice between different kinds of apple, each having its own characteristic 'bite'. The apple is a very versatile, but a common, everyday product, which enjoys a host of loyal fans.

Almost everyone knows tooth decay as well, from personal experience or from stories by other people. In the western world, almost 100 per cent of the population suffers in some degree from caries, which is the official name of tooth decay. The most likely cause of this is the presence of certain bacteria in the mouth, which play a role in the processing of sugars. Young children are particularly affected by caries. Good dental care comprises several activities, basically aimed at increasing mouth hygiene.

What is the link between the apple and tooth decay, you may wonder? Well, scientists using genetic engineering have developed a new apple. This new apple contains bacteria that may help to keep the teeth healthy. This is the latest development in a series of applications of genetic engineering to reach a state in which they are ready for the market.

Second part of the positive message condition

The question is how the consumer will react to this techno-apple. If you ask me, the genetically engineered apple is a desirable product which should be welcomed on the market.

Second part of the negative message condition

The question is how the consumer will react to this techno-apple. If you ask me, this genetically modified apple should not be admitted to the market.

Part 2

The Efficacy of Public Opinion
