



Consumer Reactions to a Crisis: A Note The Case of the Madcow disease

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Abstract

What drives the behavior of consumers when faced with a product-related crisis, such as that involving food contamination or live-threatening design flaws? For both consumers and companies, these crises are become of increasing importance because of the globalization of markets and an increased coverage by the media. These crises show the need for marketers to understand why and how consumers react to a crisis. We show that by de-coupling risk response behavior of consumers into the separate components of risk perception and risk attitude, a more robust conceptualization and prediction of consumers' reactions is possible. In addition, such a framework helps to provide answers on how marketers can deal with such type of crises. The merits of such conceptualization are illustrated in two field studies in the US, Germany and the Netherlands, in the context of the recent BSE (madcow disease) crisis.

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1. Introduction

What drives the behavior of consumers when faced with a product-related crisis, such as that involving food contamination or live-threatening design flaws? While some crises have influenced the marketing and communication efforts of individual companies (such as Tylenol, Perrier, Ford, Goodyear, and Shell), others – such as the threat of BSE in beef – can threaten to compromise an entire industry. What is interesting is that the behavior of consumers in a crisis situation is not always consistent with the true level of risk they face. This research examines how the behavior of various segments – in this case, countries – are differentially influenced by risk perceptions and risk attitudes. Knowing the drivers of behavior, provides insights on whether the solution to the crisis lies in particularly accurate communication or in more drastic measures with respect to product supply.

The crisis in the European beef sector as a result of the mad cow disease is a case in point. These food safety crises have the potential to dramatically illustrate the need for marketers to understand why and how consumers react to a crisis. We argue that by decoupling the risk response behavior of consumers into the separate components of risk perception and risk attitude, we can develop a more robust segment-level conceptualization and prediction of consumers' reactions. This, in turn, provides answers to how marketers can deal with different segments of consumers in a crisis situation.

Since such crises are often seen as wide-spread, catastrophic, and of irrevocable consequence, we examine the crisis of madcow disease because of its economic consequence to an entire industry and an entire continent. To examine how different segments are influenced, we conduct two field studies with three segments that have responded differently to the crisis. In this case, the segments are countries: Germany, the Netherlands, and the United States. We show that the relative influence of risk perception and risk attitude on consumers' reactions differs, among others, depending on the accuracy of knowing the probability of being exposed to the risk. These results also suggest while honest and consistent communication is effective in some countries, other countries require more extreme measures with respect to product supply.

We begin with a brief overview of the role of risk attitude and risk perception in consumer behavior. The independent impact both concepts have on behavior is then reviewed. A conceptual framework of risk behavior is presented with both independent variables and their interaction. Two field studies examine this framework across three countries. The results strongly suggest that de-coupling risk attitudes from risk perceptions can be valuable in determining what really drives various segments of consumers in crisis situations. Knowing these drivers suggests what solutions will be most effective in controlling such crises.

2. Consumer risk behavior: some key notions

Risk is a key component of consumer behavior¹. In their seminal article, Hauser and Urban (1979) stimulated a fruitful research paradigm that focused on how risk influenced decisions.² Consumer decision-making and behavior is often analyzed and reported only in terms of risk perceptions (Bauer 1960; 1967; Bettman 1973; Rao and Farley 1987; Srinivasan and Ratchford 1991). The context of these studies is that consumers engage in risk reduction activities, such as information searching, in order to reduce their perceived level of risk. These studies assume consumers to be risk-averse and that reducing their perceived risk reduces their feelings of discomfort. The domains chosen for these studies, such as ‘buying dresses’, a domain in which ‘quality’ and ‘fit with self-image’ are key attributes (see Dowling and Staelin 1994), make the assumption of risk aversion tenable, and omitting the risk attitude variable likely does not influence the results severely.

Other domains exist – such as financial and health-related domains -- where there can be wide differences in both risk attitudes and risk perceptions (Keller 1985; MacCrimmon and Wehrung 1990; March and Shapira 1987; Pras and Summers 1978; Shapira 1995). Moreover, consumers rarely carry equal risk, and a wide variation may exist between perceived and actual risk. It is interesting to note that, depending on the individual and the situation, subjects can engage in both risk-taking as well as risk-avoiding behavior (Brockhaus 1980; Smidts 1997). This supports our view that it is valuable to take risk attitudes into account in consumer research, as consumers can respond to the same risk in very different ways.

The role of risk attitudes in customer behavior has been explored in industrial contexts too. Qualls and Puto (1989) developed a conceptual model of the industrial *buying decision process*, hypothesizing that factors such as organizational climate and the buyer’s general orientation toward risk affect the decision frame and the buyer’s subsequent choice. They found that buyers who are risk-averse (risk-taking) tend to set initial reference points that are easy (difficult) to attain, which in turn affects their decision frame and choice. Murray (1991) argued that risk attitude is a particularly important concept in services marketing due to the higher perceived risk of services over

¹ In the literature on decision-making sometimes a distinction is being made between risk and uncertainty (Knight, 1933). The term risk in that line of literature refers to the situation that the decision-maker knows the probabilities associated with the possible consequences, while the term uncertainty refers to the situations in which these probabilities are not known. In this note we will use, in line with the marketing literature, the term risk when meaning uncertainty, in the case that probabilities are known we explicitly use the term “known probabilities”. Kahn en Sarin (1988) used the term ambiguity when referring to risky decisions for which the probabilities of the uncertain event were not known.

² Risk is modeled in this paradigm by reflecting the decision-maker’s response to uncertain outcomes defined in terms of specific probabilities of risk.

goods. The concepts of risk and uncertainty have shown pervasive across many contexts involving exchange (Bernstein 1996). While often ignored in marketing the concept is heavily intertwined with marketing decisions because these decisions are influenced by “market conditions, the company and managers involved, and the amount of market intelligence gathered” (Winer 1997, p 112).

3. Conceptual Framework

We propose that consumers’ reactions to a crisis can be effectively modeled as a combination of risk perceptions, risk attitudes, and the interaction between them. *Risk perceptions* reflect the consumers’ interpretation of the chance to be exposed to the content of the risk and may be defined as a consumer’s assessment of the risk inherent in a particular situation. *Risk attitude* reflects a consumer’s general predisposition to risk in a consistent way. Risk attitude and risk perception are two different concepts. Whereas risk attitude deals with the decision-maker’s interpretation of content of the risk and how much (s)he dislikes the risk, risk perception deals with the decision-maker’s interpretation of the chance to be exposed to the content of the risk. One might expect an interaction between the two concepts. That is, the greater the risk perceived the more risk-averse consumers will avoid risk. In comparison, less risk-averse consumers will be less prone to avoid risk

Our framework is based on the notable research done by Pratt (1964) and Arrow (1971) which shows that risk management behavior depends on risk attitude, risk perception and their interaction. In Pratt and Arrow’s work, risk management, reflected in the risk premium π , is a function of risk attitude (risk aversion r), the situation (base wealth W) and perceived risk (with a mean of $\bar{\pi}$ and variance π^2 of source of additional wealth π). Risk management is determined such that the risk premium leaves the decision-maker indifferent between holding the perceived risky asset or holding its mean value minus the risk premium: $EU(W + \pi) = U(W + \bar{\pi} - \pi)$, where EU is the expected utility. In the expected utility model this translates into:

$EU(W + \pi) = \int U(W + \pi)f(\pi)d\pi = U(W + \bar{\pi} - \pi)$ where $U(\cdot)$ is the von Neumann-Morgenstern utility and $f(\cdot)$ the probability density function of additional wealth π . It can be shown that the risk premium π is equal to

$$\pi = \frac{1}{2} \int \pi^2 f(\pi)d\pi \frac{U''(W)}{U'(W)}, \text{ which can be written as: } \pi = \frac{1}{2} \pi^2 r(W),$$

where $r(W) = -U''(W)/U'(W)$, the Pratt-Arrow coefficient of absolute risk aversion.³ This demonstrates that risk management behavior depends on risk attitude $r(W)$, risk perception β^2 , and their interaction.

By de-coupling risk response behavior into the separate components of risk perception and risk attitude, a more robust conceptualization and prediction of consumer reactions will be possible. The insights that result from decoupling risk perceptions and risk attitudes can yield important managerial implications. Consider the two following outcomes.

Outcome #1. Suppose that risk perception is the main driver of the consumers' reactions, this would imply that communicating information is a powerful tool in changing behavior. That is providing and communicating the "true" probabilities of being exposed to the risk, or in the case that the true probabilities are unknown recognizing that the probabilities are not known, is a useful tool to respond to consumers concerns.

Outcome #2. Suppose, on the other hand, that risk attitude is the true driver behind consumers responses. In such a case, even if probabilities of being exposed to the risk are small, stressing these probabilities will have little influence on consumer behavior. Instead, marketers will have to focus on eliminating the risk.

In the next section we will apply our framework for consumer behavior with respect to risk and food safety. Compared to other risky activities such as parachuting or motorcycling, risks related to food safety are unique. While some risks can be avoided, food safety-related risks can be avoided to a limited extent only. Even when a person switches from one product to another, contaminated food still remains harder to avoid than parachuting, especially in the incipient phase where the risk is not yet known to the public, and when consumers do not have full control over these risks (Slovic 1987).

3. The Health of Nations: Method and Findings

The Bovine Spongiform Encephalopathy (BSE) crisis, often referred to as the madcow disease, is fanning out across Europe causing consumer panic and disrupted meat markets. Contaminated beef can cause the Creutzfeldt-Jacob Disease (CJD) in humans

³ The formal derivation supporting this claim can be obtained from the authors.

(Abbott, 2001). Also in the US the European BSE crisis puts intense pressure on government agencies, industries and marketers (Wadman, 2001). While our understanding about the technical relationship between madcow disease and its impact on humans via the Creutzfeldt-Jacob Disease is improving (Balter, 2000, Young 2000, Bruce 1998), it does not provide guidance on how to communicate with consumers or on how to administer policy (Aldhous 2000). The fact that the chance of receiving CJD by eating beef is assumed to be extremely small, the World Health Organization reports 87 cases of CJD during the period October 1996 to December 2000, it is puzzling that consumers, react the way they do (Aldhous 2000).

What explains the different consumer reactions to such a crisis, and what solution is most effective? Our framework is useful to determine whether and to what extent risk perception and risk attitude contribute to the consumers' reactions. Insight into the influence of both concepts on consumer responses leading to a market crisis has important managerial implications. If beef consumption is mainly driven by risk perceptions (the likelihood of contracting CJD), the solution of the BSE crisis characterized by a low probability of getting a disease lies first of all in information dissemination and education. If, however, the consumers' response to the BSE crisis is mainly driven by risk attitude (risk aversion), the beef industry have fewer and costlier options, namely to test each cow for BSE and if positive to slaughter them. To better understand the impact of BSE on consumer behavior, two key questions need to be answered: 1) Why do consumer reactions to BSE vary across countries? 2) How do changes in levels of risk affect beef consumption?

To answer these questions, 228 consumers from the United States, 298 from Germany, and 223 from the Netherlands were interviewed while shopping in the last week of January and the first week of February 2001.⁴ In the United States consumers of a Midwest University town were intercepted while shopping in a grocery store. In Germany and the Netherlands shoppers were intercepted in grocery stores in five major cities.⁵ Because of changes in meat consumption since the BSE crisis these countries were selected. Our survey provides a natural experiment to generate behavioral insights and to illustrate the importance of different policy measures.⁶

⁴ In the Netherlands and Germany several cases of mad-cow disease have been reported. Since 1991, the US has taken measures to protect itself by banning imports from BSE contaminated countries and animal feeds.

⁵ The average age of the consumers ranged from 42 years in the Netherlands till 45 years in Germany and the percentage women in the three samples ranged from 51% in Germany to 60% in the United States.

⁶ Since the same content of the questionnaire was being used across countries, the precise wording was modified through backward-translation procedures.

The focus of the first part of the study was on BSE risk perceptions, risk attitudes, and beef consumption. Nine-point semantic differential scales were used to measure risk attitude and risk perception, such that the risk attitude indicators reflect consumers' predisposition to respond to risk in eating beef in a consistent way and the risk perception indicators reflect consumers' assessment of the risk inherent to eating beef (MacCrimmon and Wehrung, 1996, Shapira, 1995, Churchill 1979, Pennings and Smidts, 2000). Risk attitude and risk perception was measured by validated scales (Pennings and Smidts 2000) consisting of the following indicators for risk attitude: 1) For me, eating beef is worth the risk ("strongly disagree" to "strongly agree"), 2) I am ...("not willing to accept" to "willing to accept") the risk of eating beef, and 3) I do not accept the risks of eating beef ("strongly disagree" to "strongly agree"), and for risk perception 1) When eating beef, I am exposed to ("much risk" to "not much risk"), 2) I think eating beef is risky ("strongly disagree" to "strongly agree"), and 3) For me, eating beef is("risky" to not "risky"). Both variables had reliable construct validity exceeding $\alpha=.8$ (Churchill, 1979).

Reduction in beef consumption was measured (yes-no) and consumer knowledge of CJD was measured through multiple choice. The second part of the study presented consumers randomly with each of four scenarios and assessed their consumption intentions under four different levels of risk.

3.1 Why do consumer reactions to BSE vary across countries?

The dramatic differences in consumers' reactions to the BSE crisis are shown in Table 1. The differences between the United States and the European countries are not surprising: They probably are due to the fact that BSE has never been problematic in the United States. Most illustrative here, however, are the dramatic differences between neighbors. Both Germany and the Netherlands have a similar experience with the severity of the disease. Yet, most of the Dutch perceptions resemble American rather than German perceptions. The Dutch and Americans are less concerned about eating beef than the Germans and estimate their chance of contracting CJD relatively lower.

Table 1. Cross-country differences in knowledge about CJD and beef consumption.

	United States	Germany	Netherlands
What do you think contracting Creutzfeldt-Jacob disease from eating beef will do to you?			
• I would die; there is no treatment	24.1 %	58.7 %	58.1 %

• I might die, but there is treatment and a chance of surviving	31.5 %	19.5 %	17.8 %
• I would get very ill, and the illness would be chronic	19.4 %	9.7 %	15.3 %
• I would get ill, and will recover after some time	19.4 %	4.0 %	4.5 %
• I would feel ill, but would recover fast	5.6 %	8.1%	4.3 %
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What do you think is your chance of getting CJD from eating beef? (1=small; 9=large)	2.92	3.42	2.77
Are you concerned about eating beef? (1= not concerned; 9=very concerned)	3.74	6.27	3.80
Do you trust the information that your government provides? (1=do not trust; 9=fully trust)	5.93	3.42	5.00
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Have you reduced your beef consumption because of the BSE crisis?	17.8%	58.1%	22.9%
By what proportion have you reduced your beef consumption?	54.6%	77.7%	56.4%
Have you switched to other meat products and fish products?	17.8%	49.0%	19.7%
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Interestingly, one explanation for these different levels of concern may be because American and Dutch consumers are more trustful of the information from their governments than are the Germans. As noted in Table 1, consumer confidence in government-issued information is significantly related to consumer concern in all three countries, and while the Germans have relatively low trust in government information, Americans are highly trustful of their food regulatory agencies. Indeed, 83% trust the FDA, making it the most trusted US government organization after the Supreme Court (Wansink and Kim, 2000). Without trust in the information about BSE, fear and overestimates of risk may dramatically decrease beef consumption.

How do these variations in risk perceptions, combined with risk attitudes, influence consumer decisions about whether or not to reduce beef consumption? Logistic regressions indicated that there were significant variations across countries (see Table 2).

Table 2. Explaining Consumer Beef Reduction with Risk Attitude, Risk Perception and their Interaction

	Risk Attitude	Risk Perception	IRAP
Did you reduce your beef consumption because of the BSE crisis (0 = no, 1 = yes)? Results of logistic regression.			
	β_1	β_2	β_3
United States	- 0.920*	0.189	0.220*
Nagelkerke's $R^2 = 0.517$	(0.020)	(0.402)	(0.002)
Correctly classified choices = 84.9 %			
Germany	- 0.549*	0.688*	0.440
Nagelkerke's $R^2 = 0.663$	(0.021)	(0.000)	(0.315)
Correctly classified choices = 86.6 %			
The Netherlands	- 0.137	0.726*	- 0.033
Nagelkerke's $R^2 = 0.442$	(0.687)	(0.000)	(0.707)
Correctly classified choices = 85.4 %			

Note. An asterisk indicates that each parameter significant improves the fit when compared to the null model, which includes only an intercept, at the 5% level. Nagelkerke's R^2 is similar to the R^2 in linear regression and measures the proportion of variance of the dependent variable (reduction of beef consumption) about its mean that is explained by the independent variables (risk attitude, risk perception and their interaction).

While risk *perceptions* drive the Dutch decision to decrease beef consumption, risk *attitudes* (in addition to their interaction with risk perceptions) drive the American

decision. German behavior is determined both by risk attitudes and risk perceptions. If consumers in these three countries had equally accurate (and trusted) information, and if they had an equal risk of contracting CJD, would these differences still exist? That is, are the differences we see between countries circumstantial, or do they represent actual differences in how consumers use risk information to modify their behavior?

To determine this, all three segments of 749 consumers were presented with four scenarios in a random order and asked to “Imagine that science had shown with absolute certainty that the chances of getting CJD from eating beef are . . .” 1 in **10 million** (Scenario 1), **1 million** (Scenario 2), **100,000** (Scenario 3) and **10,000** (Scenario 4) per year. Following this, they stated if they would reduce their beef consumption.

While Americans and Germans are sensitive to changes in the probabilities of contracting CJD, Dutch consumers were even more sensitive. Their risk perceptions dramatically increased with the increasing probabilities (Scenario 1 through 4), and these perceptions correspondingly decreased beef consumption intentions (cf. Table 3).

Table 3. How changes in the probability of contracting CJD will change beef consumption.

	Percentage of Consumers that Decide to Reduce their Beef Consumption			Proportion by which Consumers Diminish their Beef Consumption		
<i>Suppose that science had shown with absolute certainty that the chances of getting CJD by eating beef are . . .</i>	United States	Germany	Netherlands	United States	Germany	Netherlands
Scenario 1:						
1 in 10 million per year	34.3%	40.9%	35.0%	41.3%	73.2%	66.9%
Scenario 2:						
1 in million per year	47.3%	49.8%	48.9%	48.8%	77.7%	73.4%

Scenario 3:						
1 in 100,000 per year	68.5%	66.7%	75.8%	57.6%	80.6%	78.0%
Scenario 4:						
1 in 10,000 per year	73.5%	75.2%	86.5%	69.7%	91.1%	89.1%

Earlier we examined how beef consumption was influenced in the present situation where consumers have *inaccurate* information about the probabilities of contracting CJD. How is this changed when they have *accurate* information? In that case, as the logistic regression results in Table 4 show, risk perception enters the equation in all three countries and for all scenarios by means of its main effect or its interaction with risk attitude. Also when accurate information is available, risk attitude remains an important driver of beef consumption in the US and Germany, and becomes important in the Netherlands in high-risk scenarios.

Table 4. How different risk levels influence beef consumption.

Scenarios 1 to 4 go from least risky to most risky. An asterisk indicates that each parameter β significantly improves the fit when compared to the null model, which includes only an intercept, at the 5% level. The reported R^2 is the Nagelkerke's R^2 and is similar to the R^2 in linear regression and measures the proportion of variance of the dependent variable (reduction of beef consumption) about its mean that is explained by the independent variables (risk attitude, risk perception and their interaction), and the reported cc is the correctly classified choices (e.g. the predictive validity).

	Risk Attitude (RA)	Risk Perception (RP)	RaxRP
	β_1	β_2	β_3
United States			
Scenario 1 ($R^2 = 0.47$, cc = 0.33)	-0.298*	0.525*	0.010

81.3%)

Scenario 2 ($R^2 = 0.49$, cc = 76.4%)	- 0.309*	0.470*	0.005
Scenario 3 ($R^2 = 0.52$, cc = 84.2%)	- 0.752*	0.544*	0.047
Scenario 4 ($R^2 = 0.51$, cc = 82.8%)	- 1.128*	0.515*	0.090*

Germany

Scenario 1 ($R^2 = 0.56$, cc = 82.8%)	- 0.403*	0.218	0.045*
Scenario 2 ($R^2 = 0.65$, cc = 84.5%)	- 0.473*	0.282*	0.071*
Scenario 3 ($R^2 = 0.64$, cc = 88.1%)	- 0.543*	0.212	0.066*
Scenario 4 ($R^2 = 0.65$, cc = 90.5%)	- 0.332	0.456*	0.002

The Netherlands

Scenario 1 ($R^2 = 0.56$ cc = 83.0%)	0.203	0.577*	0.040
Scenario 2 ($R^2 = 0.61$, cc = 83.6%)	0.285	0.744*	0.052
Scenario 3 ($R^2 = 0.66$, cc = 91.4%)	- 0.477*	0.032	0.081*
Scenario 4 ($R^2 = 71.4$, cc = 94.6%)	- 0.647*	0.590*	0.034

3.2 What is the answer to the BSE crisis?

Our research demonstrates that the way marketers respond to the BSE crisis should take into account whether a country's beef consumption is influenced more by risk

perceptions or by risk attitudes. The relative influence of risk perception and risk attitude on beef consumption depends, among others, on the accuracy of knowing the probability of getting CJD from eating beef.

If the probability of contracting CJD is not accurately known--which is the current situation--this analysis shows different policy implications for different types of countries. In countries such as the United States, tough measures are required to prevent a BSE crisis because risk attitudes drive consumption and little can be done to change consumers' risk attitudes. This means testing and slaughtering all suspected cows. In countries such as Germany, both risk perceptions and risk attitudes drive consumer behavior, suggesting not only the need for tough measures, but also for extensive and responsible dissemination of information by government, industry and media. In contrast to the US and Germany, Dutch consumer behavior is driven mainly by risk perceptions. In this case, honest and consistent communication by both the government and the beef industry is more effective than a mass slaughtering of cows.

If the probability of contracting CJD is accurately known (or becomes more accurate), risk perception becomes a more important driver of beef consumption both in Germany, the Netherlands, and the US. In this high accuracy context, messages from marketers, beef industry, and the media will have a greater influence on consumer behavior and beef consumption and will be important instruments to tackle a BSE crisis (e.g., Tversky and Kahneman, 1981, Slovic, 1987). Because in that context risk attitude continues to influence US and German beef consumption, also in this situation government and corporate communication efforts need to be combined with tough measures. On the production side, an ounce of prevention is worth a pound of cure, but on the policy side, an ounce of information is worth even more.

4. Conclusions

We have developed a framework of consumer risk behavior in case of fundamental problems with specific product characteristics. We argue that consumers' reactions are influenced by their risk attitude and by their ability to perceive the degree of risk in a situation. While "perceived risk" has often been used as an explanatory variable, we argue that the behavior of consumers is a function of both perceived risk and risk attitude. By de-coupling risk response behavior into the separate components of risk perception and risk attitude, a more robust conceptualization and prediction of consumers reactions is possible. In general, we find that behavior toward a risk-related crisis (such as food safety) is driven by different factors for different segments. This has important managerial and public policy implications. If a segment's behavior is driven primarily by risk perceptions, the solution lies in combining consistent and effective communication with ongoing efforts to reduce the risk. If a segment's behavior is instead driven by risk attitudes, such as risk aversion, in the end the only effective efforts will lie in eliminating the risk.

Our findings with respect to the BSE crisis confirm our framework. If consumers' reactions are mainly driven by risk perception, measures that increase the consumers' knowledge about the probabilities of being exposed to the risk (e.g., getting CJD) may be effective. If, however the consumer response to the crisis is mainly driven by risk attitude, the marketer has fewer options. In fact than, ultimately, the only tool available is to eliminate the risk (e.g., slaughter all cows who might have BSE or check every single cow for BSE).

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