

# Consumer Risk Perceptions and Marketing Strategy: The Case of Genetically Modified Food

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## ABSTRACT

New technologies are hitting the marketplace every day. In trying to make sense of these new technologies, consumers perceive a series of risks and benefits of consumption and use those perceptions to form product judgments. One way for managers to mitigate organizational related risk is to understand how consumers perceive consumption-related risk. To illustrate this point, the case of genetically modified (GM) food is examined and a series of focus groups is conducted in which participants examined different product labels that either framed the technology as a benefit gained or as a risk avoided. The results indicate that consumers do indeed form very different product evaluations based on how the new technology is framed, but these evaluations vary based on the level of the consumers' preexisting knowledge. This study provides support for the contention that a better understanding of consumer risk perceptions is an important first step in developing marketing strategies for new technology-oriented products. © 2013 Wiley Periodicals, Inc.

*Often the difference between a successful person and a failure is not one has better abilities or ideas, but the courage that one has to bet on one's ideas, to take a calculated risk—and to act. — Andre Malraux (French artist and statesman, 1901–1976)*

## CONSUMER PERCEPTIONS OF RISK

As many as 95% of new products that are introduced into the market each year eventually fail (Burkitt & Bruno, 2010). With statistics such as these, it is no wonder that marketing managers would be interested in trying to find ways to mitigate risk. This study argues that in order for managers to mitigate risk for their organizations, they need to develop a better understanding of how consumers form risk perceptions about new products and technologies.

With new technologies entering the marketplace every day, the consumer's task in understanding these technologies can be quite difficult. Recent research in the area of consumer perceptions of risk has found that, when faced with uncertainty, consumers often view a new product as either a set of benefits received or as a set of losses avoided (c.f., Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006). Consider the case of a consumer who is contemplating getting a flu shot this year. The benefits received would be health and productiv-

ity, whereas the losses avoided would be things like fever, stomach problems, and aches/pains. Because consumers think in these terms, marketing managers often use communications strategies to frame new products in terms of benefits gained or losses avoided (c.f., Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006).

In managing their product portfolios, marketing managers try to develop the most effective communications, distribution, pricing, and product strategies. The main argument in this study is that in order for marketing managers to mitigate the organization's risk and design, for example, more effective loyalty programs, advertising campaigns, and product extensions, they need to have a well-developed understanding of their consumers' perceptions of risk. The following sections will develop this argument, present a conceptual model, and then illustrate the argument with an example of how one set of consumers utilized risk perceptions as they formed evaluations about a new technology-oriented product: genetically modified (GM) food.

## Antecedents to Risk Perceptions

One way of understanding how consumers perceive risk is to view risk perceptions as a trait characteristic. This research stream suggests that individuals generally fall into two subgroups of individuals: those who have a

tolerance and even a preference for risk and those who are more cautious and would prefer to avoid risk (Goldstein, Johnson, & Sharpe, 2008). Compared to managers, entrepreneurs have been found to be accepting of risk; indeed, these individuals might even self-select an entrepreneurial career because of their preference for flexible thinking, less structure, and more responsibility (Stewart & Roth, 2001). Entrepreneurs simply gather, interpret, and process information differently than managers (Keh, Foo, & Lim, 2006). Thus, a person's own personality traits are one antecedent to the formation of risk perceptions.

Another antecedent to risk perception formation is trust. In general, consumers believe information about risk that is provided by trusted sources, but do not believe information that is provided by untrusted sources (Kuttschreuter, 2006). In one study about a new technology-oriented product, the perceived benefits of the new product mediated the effect of trust on support for the product (Knight, 2007). In other words, higher levels of trust in the source of the information lead to higher perceptions of perceived benefits of the product, which then lead to more positive evaluations of the product (Knight, 2007).

### Consequences of Risk Perceptions

Regardless of how an individual's personality traits or trust might propel them toward or away from risk, a variety of studies across a variety of different contexts have found that consumers also interpret risk on a case-by-case basis, based on the situation and the context (Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006; Knight, 2007; Zepeda, Douthitt, & You, 2003). This context-dependent conceptualization of risk perceptions suggests, for example, that an individual might be much more likely to tolerate risk when it comes to food choices than with extreme sports. Using this conceptualization, if there are no perceived benefits from consumption, risk perceptions increase (c.f., Zepeda, Douthitt, & You, 2003). The literature reveals that there are several consequences of forming risk perceptions: more/less information seeking, differences in cognitive processing, changes in affect, and alterations in behavior.

**Information Seeking.** Perceptions of risk have an impact on information seeking. Specifically, if consumers view the product as a set of benefits to be gained, they are likely to seek out more information on the product in order to form a more well-rounded opinion of the product; if consumers view the product as a set of losses to avoid, they are less likely to seek out additional information (Klerck & Sweeney, 2007; Kuttschreuter, 2006; Wilson, Evans, Leppard, & Syrette, 2004) perhaps because no additional information is needed for them to form an opinion. Greater amounts of "objective knowledge" about technology-oriented products (those based

on scientific facts) result in lower perceptions of risk (Klerck & Sweeney, 2007)

**Cognitive Processing.** Risk perceptions also have an impact on how an individual is likely to process information. In one study of risk perceptions for a new drug, the severity of the risk (chance of a slight headache vs. chance of permanent nerve damage to the brain) had the biggest impact on product perceptions and intentions whereas risk frequency (very rare vs. very common) had no impact on product perceptions or intentions (Cox, Cox, & Mantel, 2010). These authors contend that consumers have difficulty making probability judgments and using mathematically based estimations, especially when evaluating a risky product (Cox, Cox, & Mantel, 2010).

**Affect.** The framing of the message itself can impact short-term affective states, like mood. Indeed, consumers in one study were found to have a more positive mood when they read a gain framed message (Cox, Cox, & Zimet, 2006), while no change in mood was found when consumers read a loss framed message (Cox, Cox, & Zimet, 2006). When consumers are in a positive mood, their assessments of risk are more accurate (Cox, Cox, & Mantel, 2010). The authors contend that this is because consumers who are in a positive mood are more flexible cognitively, are better able to evaluate alternatives, and are better able to consider multiple pieces of information at a time (Cox, Cox, & Mantel, 2010). Not only do risk perceptions impact affect, but affect also impacts perceptions of risk (Foo, 2011). When individuals experience emotions related to certainty and control, they report lower levels of risk; alternatively, when individuals experience emotions related to uncertainty and lack of control, they report higher levels of risk (Foo, 2011).

**Behavior.** Greater perceptions of risk lead to more efforts to avoid risk (Cox, Cox, & Zimet, 2006; Kuttschreuter, 2006). For some technologically oriented products, greater perceptions of risk lead to a lower propensity to buy those products (Klerck & Sweeney, 2007; Zepeda, Douthitt, & You, 2003).

While there is a wide variety of technologically oriented products available for individuals to consider, one category of products that could likely result in fairly simple behavioral changes is the category of food. Food choices are very personal and can have important implications for well being and health. Further, compared to other types of behavioral changes regarding technology, changes in food purchasing behavior require a much smaller financial investment. Thus, a careful investigation into food technology and consumer risk perceptions could prove to be particularly insightful.

## A NEW TECHNOLOGY: GM FOODS

According to USDA Crop Acreage reports, 95% of the sugar beets, 93% of the soy, 94% of the cotton, and 88% of the corn produced in the United States are GM varieties (United States Department of Agriculture, National Agricultural Statistics Service, 2012). Since GM varieties are often mixed with ordinary varieties during shipping and storage, an estimated 75% of processed foods on American grocery store shelves contains some GM ingredients (Hallman, 2012). However, despite the fact that most Americans have been consuming GM foods for several years, national surveys indicate that most Americans know very little about them (Hallman, Hebden, Aquino, Cuite, & Lang, 2003; Hallman, Hebden, Cuite, Aquino, & Lang, 2004; International Food Information Council (IFIC), 2012; PIFB, 2004). Fully 70% of Americans are unaware that GM products are currently on American supermarket shelves and most Americans are quite confused with respect to the technology (IFIC, 2012). While 19% were correct in saying that products made from GM corn were available, 18% thought that GM meat, eggs, and fish were available (they are not) and 10% thought that GM tomatoes were available (they have not been since 1997) (IFIC, 2012).

One likely reason that most American consumers are unaware of the pervasiveness of GM foods is that these products are not required by law to be labeled. Under US Food and Drug Administration (FDA) guidelines (FDA, 2001), food manufacturers can voluntarily label their products as containing GM ingredients, but they are not required to do so. Similarly, manufacturers can label their products as containing no GM ingredients as long as the labeling statement does not express or imply that the non-GM food is superior (FDA, 2001).

American consumer advocacy groups and some legislators have tried to change this policy by introducing initiatives that would make labeling mandatory (Allen & Cummins, 2012; Food Safety and Inspection Service, 2002; PIFB, 2003a; The Campaign to Label Genetically Engineered Foods, 2005). These have included efforts at the federal level such as the "Genetically Engineered Food Right to Know Act" introduced into the U.S. House of Representatives numerous times since 1999; the most recent of which was in 2011 (H.R. 2011). Mandatory labeling bills have also been introduced in at least 20 states, but have received fierce opposition from agri-businesses such as Monsanto (Allen & Cummins, 2012). Globally, there is quite a bit more skepticism and legislation to eliminate GM crops and food (c.f., Alvarez, 2003). German chemical giant BASF recently declared that, because of consumer resistance to GM foods, it will no longer produce these crops in the European Union (Keating, 2012a) and the French government is engaging in ongoing efforts to eliminate all GM crop production on French soil (Keating, 2012b).

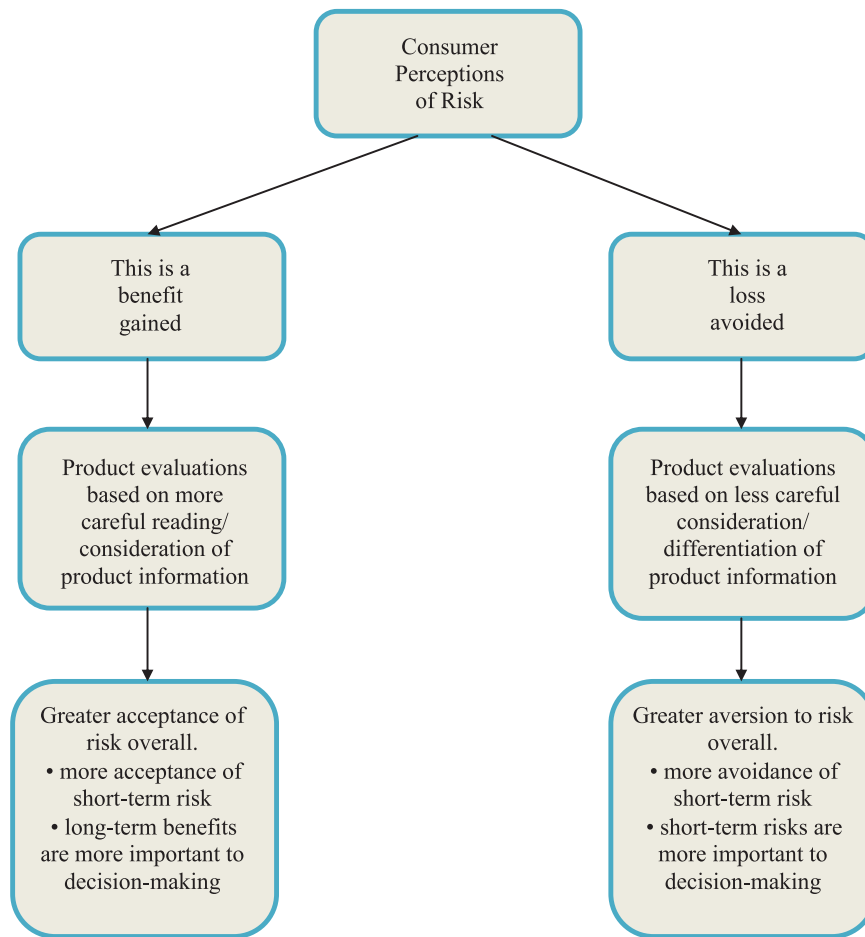
## To Label or Not to Label, that is the Question

Despite these calls for labeling, the argument against labeling that seems to resonate most with public policy makers is that consumers will view the labels as a warning. Labeling opponents claim that such labeling creates an unwarranted bias against GM products. They argue that the current FDA guidelines are more than enough to ensure the safety of these products and that GM foods are among the most tested food products in history, falling under the purview of the risk assessment principles of the international Codex Alimentarius Commission (2003). The World Health Organization (WHO) has also concluded that GM foods currently in the international market have passed risk assessments and have not been shown to present risks for human health, nor are they likely to (WHO, 2005). This stance is supported by the food industry, which claims that labels would imply that the products are of inferior quality, are unsafe (Grocery Manufacturers Association, 2012), or would confuse consumers and place importance on something that is not a safety or health issue (PIFB, 2004). These concerns might have some validity. Recent polling demonstrates that if a food product were to have a GM label, more than half (52%) of consumers would be less willing to purchase it (Hallman et al., 2003). Conversely, if a product does not contain GM ingredients, studies suggest that consumers may be willing to pay more for the product (Runge & Jackson, 2000; Van Wechel, Tamara, Wachenheim, Schuck, & Lambert, 2003).

## New Technologies = New Risks?

Regardless of how the labeling debate is finally settled, biotechnology represents a completely new technology; something unlike anything that consumers have seen before. Therefore, consumers need to interpret new information about this technology and try to understand its implications. American consumers view the debate over GM foods as one that essentially comes down to risks vs. benefits (Knight, 2007).

This study seeks to provide additional insight into how consumers utilize risk assessments regarding new technology-related products and how they may use that information to form product evaluations. Previous research indicates that consumers view risks as either a set of benefits to be gained or a series of losses to be avoided (Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006). The conceptual model presented herein uses this as a starting point. For consumers who view the product as a set of benefits gained, it is likely that they will form their product evaluations on a more careful reading and consideration of the product information (Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006). These individuals are more accepting of risk overall, implying that they are more accepting of short-term risk, but tend to weigh long-term risks more heavily



**Figure 1.** Conceptual model.

in their decision making (Cox, Cox, & Mantel, 2010). From a managerial perspective, this would imply that these consumers might be more willing to pay a little bit more for a product, travel further to get the product, or settle for a less-than-perfect looking product (all short-term risks) in order to gain a longer term benefit. Additionally, it is feasible that attitudes formed under these circumstances might be more resistant to change (see Eagly & Chaiken, 1993).

Alternatively, for consumers who view the product as a set of losses to avoid, these consumers are less likely to base their product evaluations on a careful consideration and differentiation of the product information (Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006). These consumers experience a greater aversion to risk overall, are more likely to avoid short-term risks, and will likely weigh short-term risks as more important in their decision making (Cox, Cox, & Mantel, 2010; Cox, Cox, & Zimet, 2006). Compared to consumers in the benefits gained category, these consumers may be less likely to pay higher prices, go out of their way to get the product, or select a less than perfect looking fruit, for example (see Figure 1). Determining which kinds of risk assessments consumers are likely to make thus has very important implications for marketing strategy.

## METHODOLOGY

### Study Participants

Participants were recruited at food stores in a major metropolitan area in the Northeastern United States using in-store intercepts. Shoppers identified as responsible for making food purchasing decisions were screened and invited to participate. Six focus groups were conducted; each was stratified according to the type of store from which the participants were recruited and their overall knowledge of food-related technologies, categorized as low, medium, or high. Each group was constructed to include a diversity of age, race, gender, and education (see Table 1). After the sessions were completed, participants were thoroughly debriefed and dismissed.

### Choice of Product

Canned sweet corn was selected as the focal product because of its high annual per capita consumption in the United States (5.3 pounds) (United States Department of Agriculture, Economic Research Service, 2008) and



**Table 1. Demographics of Participants.**

	Conventional Food Store Shoppers ( <i>n</i> = 29)	Natural Food Store Shoppers ( <i>n</i> = 13)	Total <i>N</i> = 42
Gender			
Male	12	5	17
Female	17	8	25
Education			
High school	4	–	4
Technical school	3	–	3
Some college	4	4	8
Bachelor's degree	4	3	7
Some graduate	3	1	4
Graduate degree	11	5	16
Age			
22–34	3	5	8
35–49	14	5	19
50–64	7	3	10
65+	5	–	5
Race			
Caucasian	23	9	32
African American	5	3	8
Other	1	1	2

because GM varieties of sweet corn are currently in the market in the United States.

### Labeling Designs

A set of 12 labels was created using design elements of a well-known brand of canned corn that is currently available in grocery stores. Label designs were created to vary the term used to describe the technology, certainty that the product contained GM ingredients, and potential benefits or risks of the technology.

**Term Used.** The European Union requires the use of the term “genetically modified” (GM) or “genetically modified organism” (GMO) in its mandatory labeling rules (The European Commission, 2003). However, the US FDA discourages the use of the term “genetically modified” since all plant-based foods are the result of genetic modification achieved through selective breeding, crossbreeding, and other traditional agricultural practices (FDA, 2001). Because some food manufacturers have used the term “genetically engineered” on labels, each of these labeling designs were tested.

**Uncertainty.** Some food manufacturers may be unable or unwilling to certify that their products are free of GM ingredients. Faced with a requirement to label their products, however, manufacturers might include a label on their packaging indicating “this product may contain GM ingredients.” Given that the majority of processed foods already contain such ingredients, such a label might serve as a low-cost alternative to more expensive procedures requiring identity preservation. However, consumers may view this format as a warn-

ing, since it mimics the warnings found on other products (e.g., “this product may contain peanuts”). Because this kind of wording is a very real alternative for food manufacturers, this element of the label was varied as well.

**Certainty.** In cases where food manufacturers are certain that their products contain GM ingredients, products may be appropriately labeled as such. A manufacturer might list “genetically modified (engineered) whole kernel corn” as an ingredient. Several studies have tested how consumers respond to information on a food product’s ingredients panel and nutritional facts panel and have found that consumers do report using these labels (c.f., Andrews, Burton, & Kees, 2011; Hellier et al., 2012).<sup>1</sup>

**Benefit Gained.** Studies suggest that consumers tend to be more approving of GM food if information about the technology is presented (Teisl et al., 2002; VanWechel et al., 2003), if they perceive a direct benefit of the technology (Hine & Loureiro, 2002; Moon & Balasubramanian, 2003), or if the information about the technology is positively framed (VanWechel et al., 2003). Consumers may also be willing to pay a small price premium for GM products that have benefits they care about (Loureiro & Bugbee, 2005).

To examine this, information was added to the label to reflect a direct nutritional benefit to the consumer. In this design, “genetically modified (engineered) whole kernel corn” was included in the list of ingredients. In addition, labeling information that the corn had been “genetically modified (engineered) to increase protein content” was placed in the upper right column of the back of the label. Finally, the nutritional information panel was altered to show a protein content per serving of 16 g (about the same amount as contained in a protein bar) instead of the normal 2 g. High-protein corn is a product currently under development, primarily to improve the diets of individuals in the developing world.

**Loss Avoided.** In a separate alternative, a statement indicated that the corn had been “genetically modified (engineered) to reduce pesticide use.” This was also placed in the upper right column of the back of the label. In one recent national survey, 44% of those who initially disapproved of GM food products said they would be willing to purchase them if they contained less pesticide residue than ordinary food (Hallman et al., 2003). For a summary of the labeling designs, see Figure 2 and Table 2.

<sup>1</sup> It should be noted that Section 403 of the Federal Food, Drug, and Cosmetic Act (FDCA), FDA does not permit the use of any additional language that modifies the common or usual name of ingredients in the ingredients statement. As such, the addition of “genetically modified” in the ingredients panel is not acceptable under current FDA standards (FDA, 2001).

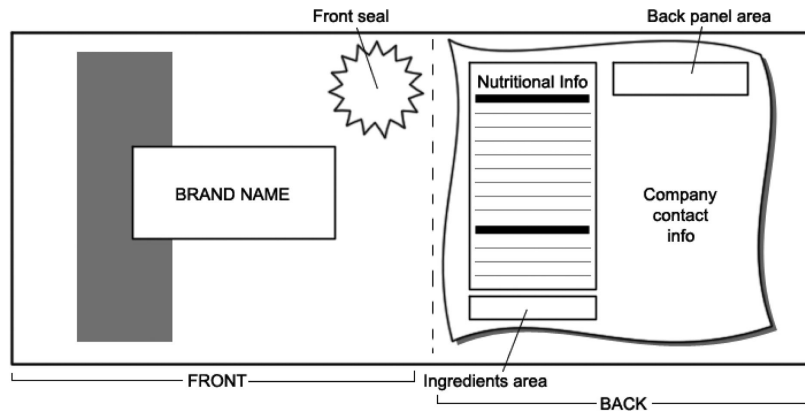


Figure 2. Line drawing of label layout.

Table 2. Summary of Labeling Designs.

Wording	Term	Certainty	Benefit Gained/ Loss Avoided	Placement
This product may contain genetically modified (engineered) corn	GM or GE	No	None	Back panel area
Genetically modified (engineered) golden whole kernel corn	GM or GE	Yes	None	Ingredients area
Genetically modified (engineered) to increase protein content (Ingredients: Genetically modified (engineered) golden whole kernel corn)	GM or GE	Yes	Increased protein	Back panel & ingredients areas
Genetically modified (engineered) to reduce pesticide use (Ingredients: Genetically modified (engineered) golden whole kernel corn)	GM or GE	Yes	Reduced pesticides	Back panel & ingredients areas

## Procedure

Participants examined one can of corn at a time and noted their observations and evaluations on an exercise sheet. Once the sheets were collected, the moderator then prompted participants to discuss their observations. The order in which the labels were examined was counterbalanced across focus groups. Finally, to eliminate the anticipated problem of varied knowledge and understanding of GM, a basic definition of the technology was read to the participants after they had examined and discussed the first set of labels:

*“Genetic modification involves new methods that make it possible for scientists to create new plants and animals by taking parts of the genes of one plant or animal and inserting them into the cells of another plant or animal. This is sometimes called genetic engineering or biotechnology.”*

## RESULTS

### About the Participants

To confirm that participants were assigned to the correct level of knowledge, they completed a brief knowledge assessment. The results confirmed the assign-

ments of the participants into low (mean = 2.03 on a 7-point scale), medium (mean = 4.25), and high (mean = 6.28) knowledge categories.

**Low- and Medium-Knowledge Consumers.** Most individuals in the low-knowledge condition had little familiarity with the concept of GM and immediately asked for a definition. These individuals read labels “every so often” and mostly reported that they read labels primarily for nutritional facts such as sodium, fat, or carbohydrate content.

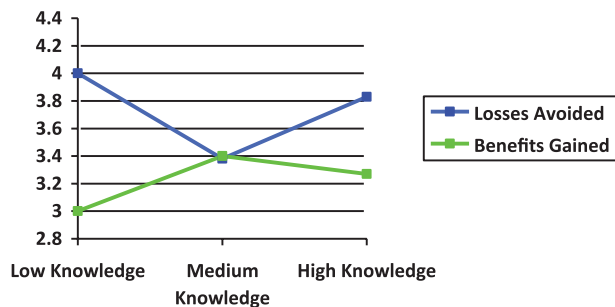
In contrast, the participants in the medium-knowledge condition reported being more familiar with GM foods. Interestingly, many participants made reference to GM as being no different than traditional crossbreeding. These participants were primarily concerned with price, quality, freshness, and brand name. They typically only read labels when evaluating a new product or if something had changed about a familiar product. Participants said they were concerned with sodium, fat, and carbohydrates and they looked for this information on the nutritional panel. Some participants also reported having particular dietary restrictions or preferences such as vegetarian, low sodium, and kosher diets.

**High-Knowledge Consumers.** Along with their working knowledge of GM foods, groups in the

**Table 3. Mean Product Ratings of Label Scenario by Level of Knowledge.**

	Low Knowledge	Medium Knowledge	High Knowledge	Overall
Label 1 “may contain”	3.00	4.13	4.33	3.80
Label 2 ingredients panel only	2.46	4.27	3.18	3.36
Label 3 “increased protein”	3.00	3.40	3.27	3.24
Label 4 “reduced pesticides”	4.00	3.38	3.83	3.69

7-point scale where 1 = extremely negative and 7 = extremely positive.



**Figure 3.** Product evaluations: benefits gained vs. losses avoided.

high-knowledge condition demonstrated a general understanding of production agriculture and specific food technologies such as organic agriculture. These participants described their primary food purchasing behavior as shopping for fresh whole foods, frequenting natural food stores on almost a daily basis. They also claimed to be faithful label readers, evaluating ingredients and nutritional information before choosing a product.

Most of the participants in these groups said they did not purchase canned or processed food, suggesting that these types of products are unhealthy. Nearly every participant in this group expressed a specific dietary restriction or preference including: organic, vegetarian, vegan, lactose restricted, gluten/wheat free, kosher, or low-sodium diets.

### Perceptions of the New Technology

Participants completed an overall evaluation scale and then discussed their reactions after they viewed each set of label alternatives. This 7-point scale measured the strength of positive or negative feelings individuals experienced with respect to the content of each of the labels examined. The mean scores by level of knowledge are shown in Table 3 and are graphically depicted in Figure 3. It should be noted that none of the variations in labeling content were viewed positively; all

of the overall mean ratings fell below the midpoint of the scale. The following more detailed analysis provides further insights into the findings.

**Term Used: Genetically Modified vs. Genetically Engineered.** In comparing the terms “genetically modified” and “genetically engineered,” all participants had negative reactions to the term “genetically engineered” which conveyed specific negative visual imagery including such things as test tubes, laboratories, mad scientists, and Frankenstein. For many, the term “genetically modified” implied that something was changed, but the term “genetically engineered” seemed to imply that the food was entirely manufactured by humans and not “natural.” Interestingly, there was a general feeling among participants across groups that the terms “genetically modified” and “genetically engineered” conflicted with the idea that the corn could be fresh. Many participants found the phrase “packed with fresh sweet corn” on the front of the can to be misleading, or even a “ploy” by the food manufacturer.

**Uncertainty: “This Product May Contain Genetically Modified (Engineered) Corn”.** These labels, being most ambiguous and containing the least amount of information, received the strongest negative reactions from participants across all groups. The consumers in the low and medium-knowledge groups found this type of labeling to be disturbing and misleading. Others felt it was too inconclusive and found it to be “scary” or “dishonest.” Some participants mentioned similar labels on other products, such as “this product may contain peanuts” and “smoking may cause cancer” which they knew were warnings. One participant’s reaction was, “who wants to be warned when shopping for corn?” Another noted, “I thought it was funny that it said, ‘may contain genetically modified corn.’ It makes it sound like some experiment went awry and some freak corn ended up in the can—but they do not know which one.”

Regardless of their knowledge level, most said if they encountered this label they would interpret it as a warning and would avoid purchasing the product. Interestingly, however, consumers in the high-knowledge group did have some positive reactions to this label, citing the possibility that the product *may not* contain GM ingredients.

**Certainty: “Whole Kernel Genetically Modified (Engineered) Corn”.** Reactions to listing GM (or GE) corn in the ingredients area were mixed. All groups seemed to appreciate that the label clearly identified what was in the product on the easy-to-read ingredients panel. However, the participants in the low- and moderate-knowledge groups who do not generally read the ingredients on food products felt that the information was almost hidden, for example, “I think the manufacturer tried to hide the GM ingredient. I do not like that.”

**Benefit Gained: “Genetically Modified (Engineered) to Increase Protein Content”.** This label prompted a great deal of skepticism. Some questioned whether 16 grams of protein is a safe level to consume and many thought it was an unwanted and unnecessary consumer benefit. Others felt that corn should not be a substantial source of protein and considered this benefit to be unnatural. Many also questioned whether increasing the protein content in corn was a manufacturer’s marketing ploy to get consumers to buy the product. This finding is consistent with earlier research that finds that consumers are less likely to believe information if it comes from an untrusted source, in this case, a multinational food corporation (Kuttschreuter, 2006). Typical comments were:

- *Modified to increase protein content? Is this a good thing? Why? How do I as a consumer benefit?*
- *Why should corn need to have an increased protein content? We are becoming fed like cattle to become obese!*

**Loss Avoided: “Genetically Modified (Engineered) to Decrease Pesticide Use”.** This label represented a loss avoided for the consumer; fewer harmful pesticides were used in the production of this corn. This label evoked strong responses from each group. The statement “decrease pesticide use” confused some of those in the low- and moderate-knowledge groups who were not aware that pesticides were used on corn. As such, many responded negatively, suggesting that they did not want to be reminded that pesticides were used on their food. Others indicated they did not like “the word *pesticide* anywhere near a food product label.”

After learning from the moderator that through genetic modification, a corn plant can produce its own pesticides to ward off insects, some of the low- and moderate-knowledge consumers were further alarmed.<sup>2</sup> They were now very wary of the technology and did not “want to eat something that killed a bug!” Specifically,

- *“Reduced pesticides” does not sound good to me. Something is not right. Scary!*
- *“Genetically modified” and “pesticide” are not good words for food labels.*

High-knowledge consumers seemed to be well aware that pesticides are used in production agriculture and viewed this label more favorably, largely due to its intended environmental benefit. However, there was substantial cynicism expressed about why a food manufacturer would do anything beneficial for the environment and how farmers might benefit. While they found this label to be somewhat appealing, they also indicated that the technology permitting decreased pesticide use is only a temporary benefit, perhaps pro-

moting future pest resistance. In the end, these consumers preferred fresh organically grown vegetables and would be unlikely to buy canned corn under any circumstances.

## CONCLUSION

In order to provide a set of strategic recommendations to marketing managers about how to manage new technology-related products in the marketplace, this study was designed to illustrate how consumers form risk perceptions as they contemplate the purchase of a new technology-oriented product. The overall conjecture was that just as consumers form risk perceptions of new products to mitigate consumption-related risk, astute marketing managers need to understand the nature of these consumer perceptions in order to mitigate organizational-level risk and create more effective marketing strategies that better resonate with consumers.

It should be noted that, for the most part, all of the product evaluations were fairly negative. However, in examining perceptions of risk and levels of knowledge together, an interesting pattern emerged. When consumers viewed the product as a benefit gained, the relationship took on an inverted U-shaped curve. Specifically, as levels of knowledge increased, consumers moved from low to moderate to low evaluations of the product. For a loss avoided, the opposite was true and the relationship took on a U-shaped curve. That is, as the levels of knowledge increased, consumers moved from high to moderate to high evaluations for the product.

For benefits gained, the expectation was that individuals would be somewhat more flexible and might more heavily weigh the long-term benefits of the product in their decision-making. In examining the participants’ comments, there is some evidence to support this conjecture. Participants seemed to take a bit of a nuanced view of the benefit and realized that that while increased protein is generally a good thing, they wondered why a food manufacturer would provide such a benefit to consumers.

Conversely, for losses avoided, it was expected that individuals would be more likely to think about the short-term costs associated with the product and might weigh these issues more heavily in their product evaluations. The participants’ comments provided some support for this assertion. Most were very taken aback by the thought that pesticides were used on their food. Overall, however, the product evaluations for losses avoided were higher than for the benefits gained. Further research should attempt to further clarify this issue.

## Limitations

There are a few limitations of this study. The first is the fact that participants only viewed labels for

<sup>2</sup> Note that this assertion was made by the moderator during one of the discussion sections that took place after the evaluation sheets were gathered.



canned corn. While participants all had familiarity with canned corn, high-knowledge individuals generally did not view canned products, favorably preferring to buy fresh products in season. Indeed, as Cormick (2004) argues, some consumers may be less comfortable seeing GM labels on food products they view as “natural” or “healthy” (like vegetables) than on products such as snack foods or fried products. In addition, it is unclear whether these results would generalize to products with which consumers have less familiarity. As such, to generalize the results of this study, further research should examine an assortment of other types of healthy/unhealthy and familiar/unfamiliar products.

A second limitation is that individuals in the high-knowledge groups shopped primarily at natural food stores, and many of these reported having particular dietary restrictions and preferences. As such, it is difficult to parse their greater knowledge and awareness about food technologies (and about GM technology in particular) from their beliefs, attitudes, behaviors, and ideological orientations toward food in general.

A third limitation centers around the fact that this study was conducted with only genetically modified food. Certainly, a consumer’s food choices are very personal and thus their fears about consumption are very rational; food products are consumed internally and can directly impact both short-term and long-term health and wellness. However, until this study is extended to other types of technology-oriented purchase decisions, any generalizations of this model should be made judiciously.

## Implications

In the United States, consumer advocacy groups continue to press for GM labeling laws as Americans express an increasing desire to know what is in the food they eat. Globally, significant pressure to label GM products also stems from the desire of American companies to serve global markets. If US agricultural products are to be allowed to enter the EU, for example, the products will require either the virtual elimination of GM ingredients or the strict adherence to the EU’s mandatory labeling regulations. Getting a jump start on the labeling process may be beneficial to American food manufacturers by helping them better compete in the global marketplace.

In an effort to provide guidance for marketing managers about how to create and implement impactful marketing strategies, this study presents a model of how consumers might differentially proceed through the decision-making process for a new technology-oriented product, depending on how they form perceptions of risk. In the end, managers may be able to mitigate organizational-related risk by better understanding how consumers perceive consumption-related risk.

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