Consuming, Studying, and Regulating Genetically Modified Foods: A Case for Transformative Consumer Research

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ABSTRACT

ACR 2005 North American Conference calls for Transformative Consumer Research (TCR). Based on the principles of TCR, the objective of this paper is to provide a platform to involve consumers more directly with public policy issues related to food biotechnologies, so that this technology can actually make positive impacts on consumers' lives, both present and future generations. More specifically, through an iterative and rigorous multi-stage research design, we aim to provide valuable insights for consumers, for the academic community, and for public policy makers with respect to genetically modified foods.

INTRODUCTION

ACR 2005 North American Conference calls for Transformative Consumer Research, TCR. TCR aims to "make a positive difference in the lives of consumers, both present and future generations, through the chosen focus and conduct of specific research, and in the communicating of its implications and usefulness" (ACR 2005). An ideal TCR is one that both scientifically rigorous and practically useful to consumers. In addition, TCR aims a heightened relevance and value related to consumer research to business executives and public policy administrators (ACR 2005). Based on the principles of TCR, the objective of this paper is to provide a platform that involves consumers more directly with public policy issues related to food biotechnologies, so that this technology can actually make positive impacts on consumers' lives, both present and future generations. More specifically, through an iterative and rigorous multi-stage research design, we aim to provide valuable insights for consumers, for the academic community, and for public policy makers with respect to genetically modified foods (GMF).

This paper clarifies consumers' perceptions of the food system and particular elements of the system with respect to food safety in general and food biotechnologies in particular, and provides consumer input for the policy issues surrounding the future of genetically modified foods. Understanding consumer perceptions of this technology can have important global ramifications. Agriculture and food applications of biotechnology promise solutions for feeding an ever-growing global population. This promise may particularly be important to underdeveloped countries where there is an immediate need not only for increasing productivity in agricultural output but also for nutrition-rich food. Consumers' views in developed countries (where most biotechnology research is conducted) are likely to affect the extent to which public and private organizations commit to biotech research. For example, consumer reactions toward GMF in many European countries have reduced funding for biotech research over the last two years (ISIS Press Release, 2001). Private organizations conduct and therefore control most biotechnology research and its outputs (including various consumer products). Even though many underdeveloped countries look favorably upon food and agriculture applications of biotechnology, it will still be in the hands of consumers in developed countries to encourage or discourage biotechnology research. Results of this study can provide much needed consumer voice in the biotechnology policy debate, and in the long run our findings can contribute to regulation and communication efforts.

The policy issues (e.g. communication, education, and regulation) of GMF can be seen as a problem of the government, biotech researchers, seed/chemical companies, farmers, food producers, retailers, environmental groups, and mainstream consumers. We argue in this paper that in the heart of all these interest groups lie ordinary consumers. Once consumers' problems are identified and addressed then other interest groups' problems may be addressed adequately and fairly. Further, treating the issue as a problem of mainstream consumers would have advantages to remain "neutral."

When identifying and addressing policy problems (of consumers in this case) there seem to be two fundamentally different approaches. Those who favor the "engineering model" view social science as a means of providing technocratic solutions to problems. A problem—whether pollution, poverty, alcohol, or tobacco—can be safely agreed to be a "bad" thing by all, and the social scientist is then brought in to treat the problem in the manner that the doctor diagnoses illness. The employment of such engineering models can be discomforting and perhaps dangerous if the social scientist points out the "right" course of action when there are conflicting interests, lack of consensus, social cleavage, and (international) political conflicts surrounding the problem (like in the case of GMF). In such cases, the "enlightenment model" can accommodate better in establishing the role of researcher who attempts to provide an intellectual background of the problem using the domain of his/her discipline.

Morris Janowitz argues that the social scientist is part of the process which he or she is studying, not outside it. In other words, under the enlightenment model it is assumed that the social scientist recognizes that he/she is interacting with his subject and a variety of publics to which he must be responsible. His work has an impact on himself, and his findings influence his subjects and his public in an ongoing fashion. The enlightenment model assumes the overriding importance of the social context, and focuses on developing various types of knowledge that can be utilized by policy-makers and professionals. "While it seeks specific answers its emphasis is on creating the intellectual conditions for problem solving" (Janowitz 1972, p5-6). Research (of enlightenment model) provides the intellectual background of concepts, orientations, and etc. that inform policy. It is used to orient decision-makers to problems, to think about and specify the problematic elements in a situation, and to get new ideas. Policy-makers use research to formulate problems and to set agendas for future policy actions. Much of this use is not direct, but a result of long-term infiltration of social science concepts, theories and findings with the general intellectual culture of a society.

OBJECTIVES OF THE PAPER

As stated earlier, the broad objective of this study is to investigate consumers' views of and expectations from various key social institutions of the food system with respect to food safety and food biotechnologies in order to provide background information and insights to public policy makers with respect to the regulation efforts of food biotechnologies. These social institutions include regulatory agencies, food manufacturers, farmers, the scientific community, consumer activist groups, and media. Since we are following the footsteps of Janowitz (1972) and adapting the enlight-

enment model for social knowledge, we first seek to obtain information about the "background" of consumers. Table 1 provides information about the specific objectives of this paper.

METHODOLOGY AND METHODS

Our research is based on focus groups and in-depth interviews with consumers on topics surrounding GMF. The research design used in this study is an adoptive and emergent one. In other words, the design unfolds as fieldwork unfolds and the emergent nature of the design affects decisions regarding sampling, data collection and analysis. Our design involved a three-stage data collection process. The first stage involved seven depth-interviews with consumers in a Midwestern state on their awareness, beliefs and attitudes toward GMF. For the first study conducted in 2000, we sampled relatively educated consumers because at this time both academic and popular press noted consumers' awareness of GMF was very limited (Kilman 1999). By 2001 consumer awareness of GMF had increased from 12% in 2000 to over 70% largely due to the Starlink^{R}-corn fiasco and debates on stem-cell research. Therefore, our emergent theoretical perspective on factors that influence beliefs and behaviors related to GMF drove sampling decisions for the second stage. We sought to include informants with diverse orientations to GMF based around underlying differences in family stage, health concerns, social and political beliefs. The second stage involved 17 depth-interviews and four focus groups conducted in four different cities in Western and Midwestern states to understand in detail consumers' view of food safety and their expectations from various institutions they see as responsible for food safety. The third stage was conducted in 2002 and involved 10 depth interviews focusing on uncovering consumers' trust in the quality and safety of their food and whether and how that is related to GMF and institutions they identify as playing a role in food safety.

Data analysis was a process of gradual induction. Analysis of textual data proceeded through two distinct stages of iteration: intra-text and inter-text (Arnold and Fischer 1994; Spiggle 1994; Thompson 1997). Intra-text analysis asks a set of questions to identify the codes and categories of the findings. Once codes and categories have been identified, the researcher uses inter-textual analysis to look for patterns of relationships within different interviews (Thompson 1997). Thus, intra-text analysis addresses the extent to which general themes are shared by different respondents, and patterns of difference.

FINDINGS

The data gathered throughout the course of this research are exhaustive. Findings we report here, however, due to page limitations, will be an abbreviated version of the data. We intend to summarize the data mostly using tables and save the space for discussion.

Stage 1

Our specific objective in stage 1 was to identify consumers' knowledge, conceptualizations, overall views, and concerns about these products. We have identified more than twenty categories of the findings, however; due to page limitation, in this section we focus on the following a few themes.

a. Even though consumer knowledge and awareness of GMF is very limited, they still speculate, guess, and make assumptions as to how genetic modification of foods could be done.
b. Consumers don't seem to have well articulated preferences for GMF products. As a result consumers do not have clear categories of these foods. They are ambivalent and confused. This confusion seems to affects consumers' potential concerns about various types and applications GMF products.
c. GMF products create ambiguous consumer experiences (both in terms of product attributes and information environment) and consumers seem to use various types of analogies in making sense of their ambiguous experiences. This tells us several very interesting things about how consumers draw inferences to novel product categories (Mick and Fournier 1998) as well as their constructive choice processes (Bettman, Luce and Payne 1998). Like Mary Douglas' penetrating discussion of food that is dirty or clean (see Douglas 1966) and Levi-Strauss' (1975) classic distinction between raw and cooked food, our respondents seem to have constructs about food and food safety that they use in making decisions about this new food category.
d. Consumer education may not result in behavior change. One may argue that through provision of verbal information consumer can be "taught" about the facts of GMF and this education could benefit the providers in the long term. However, as we found out, consumers tend to link attributes of GMF to some (intended or unintended) consequences, and further linked these consequences to deeply held and enduring personal values. When these personal values "disagree" with the providers' intention, it seems very difficult (if not impossible) to make any change in consumers' beliefs and attitudes toward such food applications.

Stage 2

The findings of the first stage suggested that a more comprehensive and holistic look at the potential public policy issues surrounding these products may be beneficial. For example, the finding that consumer know very little (if not nothing) about GMF makes it very difficult to identify specific regulation (such as labeling) questions. When level of awareness and knowledge is very limited, consumers seem to use their experiences in other technology and/or food products and transferring this existing knowledge to this new yet unknown domain (a type of analogical learning). In order to provide a more detailed information environment for policy decision maker, one should try to understand these broader associations and linkages consumers make with GMF products. Therefore, the specific objective of the second study is to understand consumer background not particularly on GMF but on other related issues. These issues are numerous. However, based on the findings of the first study, we focus on consumers' overall food purchasing concerns, and consumers' views on food safety.

Consumers' Food Shopping Concerns:

Table 2 is the summarized version of responses consumers provided as their most important concerns in food shopping. Identifying consumers' food shopping concerns can provide insight into priorities consumers have when they purchase food products. We can have a general understanding regarding what consumers are looking for when they purchase food.

Consumers' Concerns about Food Safety:

Although Table 2 offered some insights into the degree to which consumers are concerned about their food supply, we could still know little if we don't look at the elaborated responses to consumers' view on food safety. In other words, Table 2 suggests that consumers didn't seem to worry too much about health and safety aspects of the food they purchase. However, there is still

TABLE 1
Summary of 3-Stage Research Design

	Stage 1 Study 1: Depth Interviews (7 respondents)	Stage 2 Study 2: Depth Interviews (17 respondents)	Stage 2 Study 3: Focus Groups (4 focus groups in 4 cities)	Stage 3 Study 4: Depth Interviews (10 respondents)
Objectives	To gain initial understanding of consumer knowledge and awareness of GMF Understanding consumer views as well as factors affecting consumer views of GMF.	Understanding consumer view of food safety Explore, in detail, consumer trust and expectations from social institutions they see as responsible for food safety		Explore, in detail, consumer trust and distrust in social institutions in terms of consumer expectations Understand the interactions between social institutions in the food system (perceived by consumers) Understand the role of system trust in food safety and GMF safety perceptions
Sampling	Convenience sampling, A relatively educated respondents were selected for this initial study (with a minimum of bachelor's degree)	Four categories of consumers were interviewed in Study 2: Married w/children Married w/o children Vegetarian consumers Living alone	Four focus groups were conducted in four cities based on following sampling Organic food buyers Living alone Married w and w/o child	Maximum variation sampling: High/low involvement with food (based on dietary practices) Urban/rural background
Key findings and implications for next study	Trust in farmers, government. food manufacturers plays roles in consumers view of GMF. Safety (perceived physical risks) of food and GM food appears to be a key issue for consumer reactions to GMF. Responses and views of GM and food safety appeared to differ based on family life cycle stages, living arrangements, and dietary practices	Consumers indicated both trust and distrust toward the same institution. Simultaneous occurrence of trust and distrust may be key to understanding consumers' view of GMF Evidence for positive and negative synergetic interactions among social institutions (perceived by consumers) begin to emerge. It is possible, for example, that trust in government may offset consumer distrust in food manufacturers. Consumers' assessment of food safety through the interactions between some of the institutions may suggest a system view for the food safety A forth social institution, consumer activist groups, appeared to play important roles in food safety		Findings and implications for consumers, researchers, and public policy makers are discussed in the paper

TABLE 2
Consumer Food Shopping Concerns

Resp.	Concern #1	Concern #2	Concern #3
1	Cost	Fat content	
2	Price	Brand name	
3	Quality		
4	No animal in it	Cruelty free	
5	Good taste (salty/hot/steak)		
6	Price	Nutritional content	variety
7	Value (best deal)		
8	Buy the things are on sale		
9	Good variety (for the family)	Fresh (in season)	
10	Buy what hungry for		
11	Price	Freshness	Quality
12	Price	Quality	Safety
13	Healthy food	Inexpensive	
14	Won' t spoil	Easy/quick to prepare	Half way healthy
15	Price	Taste	Freshness
16	Price	Taste	Healthy
17	NA	NA	NA

merit in examining consumers particular food safety concerns. Such an examination can provide information regarding the sources of consumers' suspicion and/or confidence about the food they purchase and consume.

Stage 3

The objective of stage three was to explore in detail consumer trust and distrust in social institution and in the food system. In this section, we first report our findings related to consumer trust and distrust in social institutions[1] and then we report consumers' views of the food system.

Trust in Social Institutions: The analysis of data reveals that trust in social institutions can be categorized mainly into two: confident beliefs that are based on competence/assurance (CA), and the beliefs that are based on faith and hope (FH) in particular institution. The CA aspect of trust can be characterized as knowledge and experience-based trust and therefore, more to do with consumers' own (and perhaps direct) experiences with the target of trust (e.g. manufacturers). In other words, buying (using) particular brands for years gives informants a first hand experience/reason to trust the manufacturers of these brands. Similarly, knowing that government enforces rules (such as limits on chemicals use or crop rotation) once again gives the informant a first hand reason to trust government. FH-based trust, on the other hand, is characterized as more perception-driven, indirect experience and generalized expectations with the target of trust. For example, informants can trust farmers based on the perception that farmers would not see food as a commodity and care more about the land, the earth and ultimately about consumers. Table 4 provides details about the types and sources of consumer trust in social institutions.

Distrust in Social Institutions: Coding and analysis of data reveal that there are mainly three categorizes of distrust: skepticism/cynicism-inducing distrust (SC); fear-inducing distrust; and vigilance/ watchfulness-inducing distrust (WW). Similar to those of sources of trust, informants' distrust in social institutions is mainly direct and indirect experience-based. For example, the source of distrust in media can come from direct experiences (e.g. watching inconsistent health reports in the news media for years). At the same time, consumers can have perception driven distrust (e.g. believing that most research in universities is done through grants provided by "big business" and therefore biased). Our data analysis revealed that the informants develop a number of coping mechanisms in the presence of distrust (regardless of whether based on direct or indirect experiences). We categorize these strategies (consequences of distrust) into three: skepticism/cynicism (SC), fear, and, vigilance/watchfulness (VW). Fear-inducing distrust is conceptualized as repeated and long-term experiences of suspicion that leads to great concern about the safety of food supply. When a respondent's distrust is fear-inducing, he/she intends to completely

[1]Due to page limitation, only a general framework for the findings of institutional trust and distrust is presented here. Detailed excerpts for each category and code listed in Table 4 and Table 5 are available upon request.

TABLE 3
Concerns About Food Safety

Resp.	Worry about food safety?	Rationale
1	Yes: things at home in the fridge No: things in grocery store	
2	No	Check the dates, Everything is safe
3	No	Pick, wash, cook properly
4	Yes	Not natural, insecticides
5	Yes: things in the fridge No	Stays long time (e.g. mayonnaise) Cook really good, don' t eat rare.
6	Yes: when there is a scare No: (mostly meats)	Buy fresh
7	Yes: things sitting out too long	Can spoil
8	No	Have faith in supermarkets, government, and I know how food is prepared
9	Yes: when hear on the news	
10	Yes: things at home for long time No, in general	May past expiration date
11	Yes: (meat and milk)	May past expiration data
12	No	Trust supermarkets
13	No	Usually eat healthy
14	Yes No in general	When I cook the food
15	Yes (meat) No	Texture, smell, fat, the blood, all gross Don' t eat meat
16	No	" I" buy and store my food, know where its been
17	No	Trust people to make food correctly

disregard information that comes from the target of distrust. The difference between SC and VW is that with VW-inducing distrust, informants are able to provide particular methods/strategies that help them deal with the distrust-creating situation. In other words, when distrust is VW-inducing, informant becomes active (i.e. they take an action) to overcome the situation that created distrust in the first place. For example, when an informant believes that a big food manufacturer should be distrusted because they are unable to prevent bacterial contamination (coded as VW-inducing distrust) then she takes an action and decides to buy ground beef from the grocery stores who grind their own meat, instead of buying as already grounded from big meat manufacturers. Table 5 provides more details about various types and sources of consumer distrust in social institutions.

Trust in the Food System: With respect to food system beliefs, our findings are intended to illustrate the range of beliefs and behaviors associated with food safety in general and GMF in particular among U.S. Midwestern consumers. Table 6 provides a summary of the types of informants who rely (or not) trust and distrust for food safety. As can be seen in Table 6, many informants look at a "system" for food safety. Some of them (two columns on the right) trust the system, and some of them (first column on the left) distrust the system. However, as can be seen in Table 6, not all of the informants rely on a "system" to ensure the safety of the food. For some informants, trust in one institution (e.g. the watchdog or a high authority) can be sufficient to feel safe about the food. Similarly, for some respondents, distrust in one institution would be sufficient to feel unsafe about the food supply. In addition, some informants do not rely on trust/distrust when they think about food safety. They have other ways to ensure the safety of the food they eat.

DISCUSSION

Our objective in this paper is to utilize a multiple-stage *Transformative Consumer Research* to provide insights for consumer, for consumer researchers and for public policy makers. In the following sections we offer some concluding remarks about our findings.

TABLE 4
Trust in Social Institutions

Target of Trust	Type of Trust	Sources of Trust
Manufacturers	Competence/Assurance	Competence through brand names and expertise Through inspection of products through packaging: packages product, inspected product Accountability Confidence through product testing
	Hope/Faith	Fiduciary obligations Benevolence Reputation to hold (perceived check and balance) Their business to take care
Government	Competence/Assurance	Enforcement of rules Sufficient regulations Overseeing industry operations, watching the companies Enforce recalls of problem products Government research process Motive is ensuring public safety (no profit motives)
Scientific Community	Faith/Hope	Intentions are good (to make food safer) Technology is both for producer and for consumers
Consumer Groups	Competence/Assurance	Objective, consumer oriented motives, non-profit nature Credible source of information Public education efforts
Farmers	Faith/Hope	They see food not just as commodity (closer to production, different meaning to farmers) It is their business to keep (by offering healthy products) Won' t produce things that are harmful to consumers) Doing their best for humanity
Media	Faith/Hope	Relies on press to be a watchdog Reliance (making food news available)

For Consumers:

In spite of their low awareness and limited knowledge on the issue, our informants are able to make elaborate distinctions among various genetically modified foods. In the case of GMF products, consumers do not have well articulated preferences and therefore, they construct their own categories that can help them identify their preferences. This is consistent with explications of constructive consumer choice processes (Bettman, Luce, and Payne 1998; Coupey 1994). Due to a lack of cognitive resources to generate well-defined preferences consumers tend to "construct" categories and identify preferences based on these "constructed categories of preferences" (Bettman et al. 1998, p. 187). Consumers are most likely to have well articulated preferences when they are familiar and experienced with the preference object, and the rational choice theory (Wright 1975) is most applicable in such situations.

At the very aggregate level, consumers see differences (make categorizations) between genetically modified meat and genetically modified plants. This categorization is important because, it appears that consumers use such categorization to assess how and to what extent they would be concerned about the fact that the food is genetically modified. They raise both health and moral issues as the bases for their categorization. It is also apparent that consumers use these categories to shape their GMF behaviors.

As evident from our interviews, consumers with very little knowledge of GMF products draw on existing categories to consider how to respond to these foods. This tells us several very interesting things about how consumers draw inferences to novel product categories (Mick and Fournier 1998) as well as their constructive choice processes (Bettman et al. 1998). Like Mary Douglas' penetrating discussion of food that is dirty or clean (see Douglas 1966) and Levi-Strauss' (1975) classic distinction between raw and cooked food, American consumers have meaningful categories about food and food safety that they use in making decisions about this new category of GMF products.

One interesting distinction of several of our informants parallels Mary Douglas' (1966), but expands her categories to include "junk food." American food that is labeled junk food has the peculiar characteristic of making consumers indifferent about the actual ingredients of the food. That is, once consumers view a food category as "already polluted" like junk food (the hygienic component of the pollution theory), then they might perceive that category as less threatening even if the foods within that category include genetically modified ingredients. This is an interesting finding considering some "junk food" producing companies like Frito-Lay and MacDonald's have recently elected to cut their "bio-tech" corn and potato suppliers assuming that consumers would be concerned about the ingredients of their products.

One of the most interesting aspects of our study was to uncover consumers' reactions to GMF products when they find out that they have been consuming GM foods for a long time. The basic informa-

TABLE 5
Distrust in Social Institutions

Target of Distrust	Consequences of Distrust	Sources of Distrust
Manufacturers	SC-inducing	Unjustified practices (e.g. the use of antibiotics)
	Fear-inducing	Hide information from consumers, cover things up Motivated by greed Immoral motives
	VW-inducing	Big operations can get out of hand out of control Insufficient prevention of contaminations
Government	SC-inducing	Setting low standards for food safety Setting wrong farm/food policies Surface treatment of problems (not creating real solution to problems)
	VW-inducing	Insufficient inspection of food products on the market Slow responding to reality Non regulated areas of food production
Scientific Community	SC-inducing	Creates suspicion about food quality (limiting consumer choice) Questionable findings (one-sided research) Arrogant scientists (some scientists have blinders) Research funded by big business (results skewed)
Consumer Groups	SC-inducing	Sometimes deal with unimportant issues They can create misinformation which is damaging for society Overdo things (overreact to things)
Farmers	VW-inducing	The use of potentially damaging substances in food production Overdosing chemicals (financial pressures, profit motives)
Media	SC-inducing	Irresponsible reporting (can be more damaging to society)
	Fear-inducing	Too many reports on food/health (not worthy of attention)

TABLE 6
Trust, Distrust, and Beliefs About Food Safety

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
System Distrust (Distrust Reinforcing Properties)	Distrust a particular component	Do not rely on trust or distrust	Trust a particular component	System Trust (Trust Reinforcing Properties	System Trust (Offsetting properties)
Perceived negative synergetic interactions among the components of the system	Incompetent (weak) watchdog	Up to the consumer to ensure the safety of the food. Don' t have to trust	Competent (strong) watchdog	Perceived positive synergetic interactions among the components of the system	The use of balancing strategies
Pam Terri	Larry Susan	George	Dorothy Simon	Amanda Willie	Nina

tion that we provided to the informants midway through the interview was that the majority of grocery items are already genetically modified. The responses to this additional information can be summarized in one word: "surprise." As indicated earlier, most consumers believed that they weren't eating any GMF products. More elaborate response categories to the new information are "ignorance," "irritation," and "making peace with the current condition." Overall, our informants didn't indicate a resistance to the current situation. They provided various reasons why they would continue buying these foods even though now they know these foods are most likely genetically modified. These reasons (we call them "sources of comfort") are "the practice of food safety," "maladaptive behavior," and "trust in systems or social trust."

For Academicians:

We believe that approaching policy research through the enlightenment model can lead to the discovery of various important questions of social sciences. More specifically, we believe that our findings are closely linked to various fundamental consumer behavior concepts and theories, and therefore can open up perspectives and newer ways of thinking about these concepts.

First, as indicated earlier, GMF consumption creates ambiguous experiences. Literature on ambiguous experiences suggests that when there is ambiguous evidence about the product performance consumers rely on advertising (ad-induced expectations) in making consumption decisions (Deighton 1984; Hoch and Ha 1986). Similarly, providers of these technology (food) products have mainly relied on traditional means (advertising and opinion leaders) of "reaching" consumer. For example, advertising campaigns in UK and in the US aimed at "teaching" consumers various benefits of and "easing" consumers' possible concerns with these products. Ever growing concerns about these food products (both in UK and recently in the US) may suggest a different process consumers go through when they learn and make decisions about such products.

Second, we argue that the adoption decisions surrounding these products pose challenges for innovation researchers. The innovation-decision model (Rogers 1995), and correspondingly most innovation research, is grounded in the assumption that individuals seek for information, go though persuasion, and make adoption or rejection decision about the innovation before any kind of experience with the innovation/product. The innovation-decision process seems to overlook the individual's potential "unconscious" experiences with the innovation *during* the knowledge, persuasion, and decision stages. Since these GMF products have already replaced the existing ones (according to a USDA survey, approximately 70 per cent of all food in grocery stores are already genetically modified) and hence consumers have already been consuming (have unconsciously adopted) them, the decision-making regarding further adoption (continuation) or disadoption (discontinuation) may be different. We believe that studying consumer of GMF would provide an understanding to these direct experience-based innovation-decision making processes.

Third, as the findings suggested, consumers seem to go through an analogical learning when they try to deal with GMF products. Our conceptual understanding of analogical learning has been limited to technologically complex and less fundamental product categories (e.g. Gregan-Paxton and Roedder-John 1997). However, when we deal with learning about products that are not only technologically complex (making most consumers novices and naives) but also its consequences are ambiguous (the "true" consequences cannot be determined), the frameworks such as Gregan-Paxton and John (1997) might not be sufficient. Further, genetically modified "food" is a prime example of a socially and culturally fundamental product category. We argue, in such situations, there is scope for studying consumer learning in its broader context to include social and cultural impacts.

Our findings offer valuable insights about the concept of trust and distrust. The findings suggest that public trust in various social institutions may be conceptually different, coming from different domains. For example, when an informant says "I trust government" this, according to the findings, is not exactly same as when he/she says "I trust farmers." In other words, trust in government and trust in farmers may come from two different directions, while the source of trust in government is mostly confidence based (and therefore, based mainly on direct experiences), trust in farmers is largely faith based (based on indirect experiences, perceptions, and inferential beliefs). This finding is important and should have implications for research that aims at "measuring" public trust in social institutions.

Further, the finding that informants trust various social institutions based on different domains may suggest different strategies for these institutions to reinforce public trust. For example, since trust in government has been mainly identified as confidence based (and therefore, based on direct experience and exposure with the government's activities), it may become crucial for governmental agencies to have direct and clear communication with the public in policy design and implementations. Encouraging the public's direct participation during the policy debates, and communicating the results of enforcements with the public (in the form of product recall, bans, and so forth) appear to be effective strategies government agencies can use to enhance public trust.

The findings with respect to distrust in social institutions are important for many reasons. First, as argued earlier very little attention has been paid to the concept of distrust. In addition, most research has treated trust and distrust as mutually exclusive constructs (conceptualize distrust as the negative of trust and assumed low levels of trust would indicate distrust). Our findings suggest that this notion in fact may not be correct and individuals can have both trust and distrust toward the same target at the same time. The idea of simultaneous existence of trust and distrust has been conceptualized (e.g. Lewicki et al 1998; Luhmann 1979), but relatively little empirical evidence had been produced in its favor.

We believe this study is one of the first empirical studies that deals with the concept of distrust. The qualitative nature of the study makes it even more useful in that it empirically identifies three dimensions (in the form of consequences) of distrust within which social institutions of the food system can be viewed. From a practical point of view, identification of these dimensions could potentially help design strategies to reduce citizens' distrust in various institutions.

For Public Policy Makers:

Some of the broad public policy implications of the study has been implied in the preceding ("for consumers") section. First, from the public policy point of view, consumers' meaning making about GMF products seems alarming. Consumers tend to think that such food safety practices as cooking and washing can take care of potential negative health consequences of consuming these products. Similarly, it appears that consumers are making analogies between GMF and other food categories (e.g. junk foods). Parallel to Douglas' (1966) account of dirty vs. clean food, consumers seem to believe that such food categories as "junk foods" are already "polluted." Therefore, marginal (potential) danger of GMF seems ignorable.

When we connect the findings of stage 1 and stage 2, we observe that consumers' views on GMF products are closely related to broader issues such as how they view food safety, technology,

and the interaction between food and technology. From the policy point of view, it is imperative to identify such linkages and focus on the impact of such linkages to consumer learning, unlearning, and fail to learning.

Further, stage 2 suggests that consumers are preoccupied with the cost of the food and rely (and trust) heavily on the integrity of the providers and regulators of these products. This further suggests that consumers expect a well-integrated and open communication among various types of providers and regulators to ensure the safety of GMF products. Consumers seem to extend a time credit to providers and policy makers in order for them to act in the best interest of the consumers.

Now, we would like to conclude this paper with a few specific implications of GMF policy debates. The main biotechnology debates are over the novelty of modern genetic engineering, debate over pre-release testing, debate over labeling, constitutional debate, and debate over transparency (public information). In addition, there are two fundamental debates that shape the current regulatory regimes on agriculture biotechnology applications: debate over substantial equivalence doctrine and debate over the precautionary principle.

Perhaps the most important implication for public policy of GMF comes from the finding that, as opposed to the existing views on the subject, the relationship between consumer trust/distrust in the food system and their beliefs about the safety of GMF may not be strong. For example, those who trust the system (e.g. Amanda) can still strongly demand labeling for GMF for many other reasons such as ecological, moral, and ethical reasons. At the same time, a respondent who distrusts the system (e.g. Pam) would not have health/safety related concerns with GMF.

Our study also suggest the importance of designing public policies by distinguishing between health related and other social, economic, ecological and moral concerns consumers have about GMF. Thus, regulatory agencies should broaden their scope of what is a reasonable regulatory regime for GMF. Our findings suggest there is not a failure of trust among the American public as regards regulatory agencies' dealings with GMF and other food safety issues. This is in contrast to findings in other countries and consistent with previous quantitative results. However, we find consumers favor a precautionary principle rather than a substantial equivalence doctrine as a foundation for regulating GMF, primarily because of non-food safety issues associated with GMF. The substantial equivalence doctrine was adopted by the US, Canada, and Japan following the OECD-Edinburgh Conference. However, currently the US is the only country that still relies on this doctrine to regulate GMF. EU has always been skeptical, and recently both Canada and Japan have decided to reexamine and change their underlying foundation for regulating GMF.

In addition, more research should be funded by the federal government. As one of our respondents (Pam) suggested, she would have like to see more research be done through "independent academicians" who are purely funded by the federal government. Independent academic research sponsored by the federal government is an essential component of a protective regulatory system. Unfortunately, the federal agencies that fund scientific research are not the agencies that need it for regulatory purposes. Of the three agencies with primary responsibilities for regulating GM foods, only USDA has a significant program for supporting academic research, and as Gutterman (2000) argued in her recent article, the USDA is devoted primarily to developing new applications of biotechnology, not to discovering the adverse health and environmental effects of the products of the new technologies. I believe that, in order to boost consumer trust in the scientific communities, the US Congress, for example, should create a separate program through the EPA to fund research on the potential environmental effects of GM crops and animals. As suggested in this paper, it is possible that such interactions between government and scientific communities (consumer perceptions of positive synergetic interactions) can also boost trust in the system.

Finally, our study suggested that informants see "industry" as the key player of their perceptions of negative synergetic interaction (distrust reinforcing properties) among the component of the system. At the same time, some informants see government as very important component of their confidence in the food safety system. As a result, we suggest that that public education programs should be prepared and run by governmental outlets (e.g. NPR or PBS). A relatively successful example of this suggestion was executed about two years ago. "Frontline" and "Nova" combined their efforts to produce *Harvest of Fear* aired on PBS in the fall of 2000, incidentally during the most intense days of the Starlink^{R}-corn fiasco. According to the critics, the program was "a better presentation of the controversy surrounding biotechnologies" and applauded even by the opponents of the biotechnologies (McCullum 2001)

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