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Scales or Stars? Consumer Preferences for Food Quality Signals

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Abstract

Food quality has become an increasing concern in the public health arena over recent years. Food manufactures and processors hygiene performance plays a crucial part in producing safer food products. While there are inspections assessing plants' hygiene performance, there is little direct communication of performance measures to consumers. This paper uses survey data to determine consumer preferences among a set of four alternative food labels which report such plant level performance scores. How much information, as well as the format they most prefer, is compared using a range of econometric models. Results show that consumers prefer number scheme, larger volume of quality information and are generally consistent with their preference. These findings are mostly continuous across different types of consumers.

Introduction

Much has been studied and written recently about the phenomena of increasing consumer demand for food quality. Interests include production and process attributes such as genetically modified foods (GM) organic or local production, and efforts towards country of origin labeling; specific food safety attributes such as *salmonella* free eggs; and enhanced nutrition attributes seen in functional foods. Often considerable willingness-to-pay or market segmentation leads to higher value products which claim to have (elevated levels of) one or more positive attribute(s) and/or attest to have reduced (or no) content of a negative attribute. Across each of these efforts, the food quality characteristics of concern are mostly credence attributes where inspection prior to purchase, or even consumption, cannot accurately determine the quality of the good. As such, various indicators (cues) and third party actions (private party audits or regulations) attempt to "signal" the quality of the food to potential consumers to mitigate quality uncertainty. If these efforts are not successful a market failure remains with an under-provision of high quality food. Historic indicators of food quality rely on simple "binary signals" such as a claim of "pesticide free" or "organic." More recently a move has been made in regulatory domains towards "continuous or scale signals" where multiple categories of food quality messages exist. These more complex food quality signals may be communicated directly to consumers via a label message and related risk/benefit communication, or be "translated" or transferred by an informed intermediary or activist. An example of the former is the percentage of organic content in multiple-ingredient processed foods permitted under the US National Organic Program (100%, at least 95%, at least 70%, and less than 70%). An example of the latter is the testing of nutritional quality of restaurant meals disclosed by the Center for Science in the Public Interest.

There are several related studies in the fields of consumer behavior and consumer psychology which explore cognitive patterns and how product information is processed. Researchers have assessed presentations of information volume, format and wording frames. In this paper, product label reports of food producers' hygiene performance are studied.

Literature Review

Consumer sovereignty constructs and similar traditional models of the economics of information, and psychology-based discussions of bounded rationality and processing capability suggest more complex continuous or scale quality signals may be desirable if (and only if) consumers are aware of the message, understand it and respond to product differences with planned and deliberate actions. However, the majority of the underlying models upon which such results are based have considered quality to be binary (good/bad) and not continuous. It is not clear that these models are appropriate for more complex scale or continuous signals. This complexity is further compounded for many food products with multiple quality signals, such as the case of a local organic tomato paste claiming to have reduced levels of a pathogenic bacteria and heightened lycopene.

Conventional economic theory states that when the budget constraint is binding, more goods are always preferred by consumers. Similarly, more or better quality information is usually preferred. Typically the seller knows more about the product than the buyer (Akerlof, 1970). In the food purchase case, the buyers (consumers) have less information about the hygiene performance of the producers, which is an important factor in determining the quality of the food quality. Thus, more accurate information can help eliminate or minimize information asymmetry problems and help better quality goods/service signal themselves better. However, is more information always a better thing? Having more information available than one can readily assimilate may also cause an information overload problem. This means that too much information, which may be beyond the consumers' comprehension capacity, could have negative impact on people's decision making (Scammon, 1977). This paper therefore explores consumer preferences for the "right" amount of information and how to present this information.

Previous studies have shown that simplified information enables more accurate identification of the objectively best brand but leaves subjects feeling dissatisfied and desiring more information (Scammon, 1977). Similarly, when information is absent, consumers feel regret in the cognitive process (Tsiros and Mittal, 2000). However, more information is not always better in reducing performance uncertainty and thus doesn't necessarily help consumers make the right decision (Ziamou and Ratneshwar, 2002). Indeed, certain empirical studies show that people's capacity to process information often can be as simple as a certain number - such as the magic number seven [1](Miller, 1956). In other words, high levels of calibration[2] are rarely achieved, moderate levels that include some degree of systematic bias are the norm, and confidence and accuracy are sometimes completely uncorrelated (Alba and Hutchinson, 2000).

[1] Seven is the number of pieces of information consumers can record at the same time. Due to individual differences, Miller actually proposed seven, plus or minus two, for general population.

[2] Alba and Hutchinson (2000) define "calibration" as the correspondence between consumer knowledge and the actual product information, e.g. the correspondence between self-assessed and actual validity.

When evaluating the information formatting issue, researchers found that consumers' acquisition patterns are strongly affected by how the information is framed (Bettman and Kakkar, 1977). Others argue that the way in which information is presented affects how and how much information is sought (Painton and Gentry, 1985). (See appendix 1 for a meta analysis of this literature). To date no study has explored how to convey food producers' hygiene performance on package labels. This paper considers if the information overload problem occurs in this environment, and can help determine consumer preferences for this novel type of food label information. Although this paper evaluates a hypothetical set of product/plant attributes, trends in food safety and quality signals (e.g., food service establishment scores – ref Jin paper) indicate the merit of considering such novel applications.

Hypotheses and Data

In order to determine consumers' preferences for label information and format, three research hypotheses are posed:

P_1: In terms of presentation format, consumers prefer number system than other visual or verbal systems.

P_2: Among the three different levels of information volume sets, consumers don't always prefer the largest volume set.

P_3: No matter what their preferences are, consumers are consistent with their information volume preferences.

This study uses the 2006 Ohio survey as the vehicle to deliver these questions. This state-level mail survey is bi-annual. 3,500 households received the mail survey. Four choice systems were simulated: a number system, a percentage system, a letter system and a star system (see appendix 2). Within each, there are three types of format. Using an example of shopping for ground beef, respondents were first asked to pick one of the three volume sets for each of the four schemes. (Note that the order of the volume of information among the four schemes has been randomized.) General questions include respondents' grocery shopping behavior, eating behavior, as well as demographic information. This survey data is used to test a conceptual model of whether or not more information is more preferred by consumers, and help determine an optimal format for such food safety information.

By mid-May, 1,448 usable responses were collected an effective response rate of 41.4%. T1 shows the demographics of this survey's respondents and those of Ohio and of the U.S. based on the 2000 Census (www. census.gov).

T1. Demographic comparison among the survey, Ohio and the U.S.

	This Survey	Ohio	U.S. (2000)
Median Age	53.0	36.2	35.3
Female ratio	52.1%	51.4%	50.9%
White ratio	92.1%	85.0%	75.1%

Median Education Attainment	Some college[3]	High school graduate	High school graduate
Median household income	$50,000-74,999[4]	$40,956	$ 41,994

There are several key differences in demographics between survey respondents and more general populations. First, the median age is higher. This may be because people who had the time to fill up the surveys are elderly (e.g. retirees). Second, the percentage of Caucasians is higher. Because of this, race isn't included in the models described below. In terms of household members in this survey, 81.6% households don't have children under 5, 60% don't have members between the age of 5 and 18 and 73% have at least two members above 19.

Results: Summary Statistics.

T2. Frequency of label format selections across schemes

Scheme	**number**			**percentage**			**letter grade**			**star**		
Format	1	2	3	1	2	3	1	2	3	1	2	3
Frequency	289	163	881	959	162	196	277	681	364	385	751	190
Percent	21.7%	12.2%	66.1%	72.8%	12.3%	14.9%	21.0%	51.5%	27.5%	29.0%	56.6%	14.4%

T2 shows that in each of the four schemes, the following formats (T3) are preferred by more than half of the respondents. Note that each of these four format include both plant-level and industry average performance. This denies the hypothesis P_2, showing consumers always prefer the largest volume set. This also suggests that consumers want to see some sort of comparison on labels reporting hygiene information.

T3. Preferred format for each scheme

number	**percentage**	**letter grade**	**star**
average 70 this plant 80	**80%** **10% higher than the industry average**	**B** **industry average C**	★★★☆ (industry average ★★☆☆)

The survey next asked consumers to select their preferred scheme. Table 4 shows that 45% of respondents prefer the number system, followed by almost 25% prefer the star system. This supports the hypothesis P_1, showing that among the four schemes, number system is the favorite of consumers.

T4. Frequency of scheme preference

[3] The average education year of the survey respondents was 13.8, which is equivalent to some college.

[4] Because the survey gave seven different income ranges instead of asking the respondents to write down their income, only the range where the mean income would fall could be determined.

Scheme	number	percentage	letter grade	star
Frequency	622	216	206	345
Percent	44.80%	15.60%	14.80%	24.80%

To answer the third research question - preference consistency - the letter grade and the star systems were used since (by construction) they have a clear distinction in the volume of information. The lowest level of information is defined as the plant evaluation (letter or stars, no explanation); the moderate level of information is the plant score plus the explanation of that evaluation; and the highest level of information the comparison between the specific plant score and the industry's average evaluation (shown in T5).

T5. Information volume: letter grade and star systems

	Lowest	Moderate	Highest
Letter grade	**B**	**B** **satisfactory**	**B** **industry average C**
Star	★★★☆	★★★☆ **satisfactory**	★★★☆ (industry average ★★☆☆)

If consumers select the same information volume between these two schemes, they are classified as having **consistent preferences** (difference equals to zero). Some consumers may have one level difference across the two schemes, while some other may even have a two-level difference. Thus preference differences range over -2, -1, 0, 1 and 2.[5] 1,315 valid answers are available for analysis. 67% respondents have consistent preferences, another 27.60% of respondents have a one level difference across the two systems (see T6).

T6. Preference differences

Difference	-2	-1	0	1	2
Frequency	31	113	881	250	40
Percent	2.4%	8.6%	67.0%	19.0%	3.0%

While T4 reports overall preferences across the four schemes, it is interesting to assess which consumers have consistent preferences and which level of information they prefer. Almost 70% of respondents prefer the highest level of information (table 7). This also confirms our findings in T3 – consumers prefer the highest level of information across all systems. Thus, hypothesis P_3 is also supported.

[5] This accommodates potential ordering bias within the survey design. If the order of letter grade and star systems in the survey were exchanged, the signs would reverse.

T7. Pattern choice among preference-consistent respondents

	1	2	3
Frequency	96	190	595
Percent	10.9%	21.6%	67.5%

The survey also asked if respondents think the current information on food labels is sufficient to determine the quality of the products. Results show that 48.9% agreed.

Proposed Models and Regression Results

Three econometric models are used to explore the data to answer the research question:

1) A multinomial logit model comparing preferences among the three patterns within each of the four schemes.
2) A multinomial logit model comparing overall preferences across the four schemes.
3) An ordered probit model exploring preference consistency.

1) Pattern preferences

Four similar models are run under this topic, each corresponding to each labeling scheme. Because there are three information volume formats in each scheme, the dependent variable has three values. Since there is no ordering effect among those three patterns in the survey, a multinomial logit model is adopted.

$$\Pr(y_i = j) = \frac{\exp(X_i \beta_j)}{\sum_j^J \exp(X_i \beta_j)}$$

y_i is the observed outcome (e.g. $y_i = 1$), X is a vector of explanatory variables and β_j is a coefficient, $y_i = 0$ is the benchmark case. The coefficients are estimated using the maximum likelihood method. Independent variables include consumers' demographic characteristics, including their age, gender, education level, number of household members under the age 19, and household income. In addition, whether that person is a vegetarian or not will also be included as an independent variable, serving as a non-use (bequest)[6] value. Whether the respondent think the current label information is sufficient to determine the quality of that product will also be included in the model. Note that the education level is used to measure the comprehension ability, thus the marital status and race, which don't impact this capability are not included. The employment status is not included because it makes the Hessian matrix singular.Because it is correlated with household income, the household income is adopted as a measure of households' financial status, instead of the employment status. The model is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \varepsilon_i$$

Y: pattern preference, value: 1, 2, 3.
X_1: vegetarian, value: 1 (yes), 2 (no).

[6] The: satisfaction derived by vegetarians from the expected benefit of the label information for non-vegetarians.

X_2: label sufficiency, value: 1(yes), 2(no)
X_3: age, value: 19-96
X_4: gender, value: 1(male), 2(female)
X_5: years of education, value: 0-30
X_7: number of household members under the age 19, value: 0-10
X_8: gross household income, value: 1(less than $9,999), 2($10,000 to 19,999), 3($20,000 to 34,999), 4($35,000 to 49,999), 5($50,000 to 74,999), 6($75,000 to 99,999), 7($100,000 or more).

ε_i: Disturbance term

T8. Pattern choices within each scheme

	number		**percentage**		**letter grade**		**star**	
	Y=2	Y=3	Y=2	Y=3	Y=2	Y=3	Y=2	Y=3
Vegetarian	-5.4	-33.5	26.7	-1.3	0.8	-0.4	0.6	-1.5
Label sufficiency	0.0	0.0	-0.2	-0.2	0.4**	0.2	0.3**	0.0
Age	0.0	0.0	0.0*	0.0**	0.0**	0.0*	0.0**	0.0*
Gender	-0.1	0.2	-0.2	-0.2	0.0	0.1	-0.2*	-0.1
Education	0.0	0.0	0.0	-0.1**	0.2**	0.1**	0.0	0.0
Members under 19	-0.1	0.1	0.1	-0.5**	-0.2	-0.4**	0.0	0.5*
Household income	0.2**	0.1**	-0.1	-0.1*	0.2**	0.1	0.1**	-0.1*
Log-likelihood function	-986.2		-830.0		-1123.5		-1038.8	
Restricted Log-likelihood	-1002.5		-877.8		-1164.0		-1079.8	
Pseudo R-squared	0.02		0.05		0.03		0.04	

**: significant at the 95% confidence level; *: significant at the 90% confidence level.

T8 shows that for the **number scheme**, higher household income is associated with a preference for pattern 2 or 3 compared with pattern 1. For the **percentage scheme**, compared with pattern 1, the older one is, the more likely he/she will prefer pattern 2 or 3. Lower levels of education, fewer household members under age 19, and lower household income suggests a preference for pattern 3. For the **letter grade scheme**, compared with pattern 1, consumers who think the current label information is not sufficient, as well older, more educated, and higher income households are more likely to prefer pattern 2. Older, more education, and fewer household members under age 19, are associated with a preference for pattern 3. As for the **star scheme**, compared with pattern 1, one thinks current label information is not sufficient, one who's older, one who's male, and one who has more household income, are more likely to prefer pattern 2; one who's older, who has household member under the age 19 and who has less household income, are more likely to prefer pattern 3. In short, other than the bequest value of being vegetarian doesn't show any impact, other factors all have some extent of pattern preference impact.

In sum, based on the volume of information, results suggest that people who are older, have more education, and higher household income are more likely to prefer a higher volume of information. In addition, those who think the current label information is not sufficient prefer a high volume of information. This shows that the proposed new label may help consumers make purchase decisions by providing additional information.

To further assess the conclusion drawn above, an additional analysis on the number system (the scheme preferred by most respondents) is conducted here. Pattern 1 is designated as the low volume of information and coded 0. Patterns 2 and 3, because of the comparisons they present, are considered to have a high volume of information and thus are coded together to be 1. A probit model is run. Let Y be a binary outcome variable, and let X be a vector of regressors. The probit model assumes that $\Pr(Y = 1|X = x) = \Phi(x'\beta),$ where Φ is the cumulative distribution function of the standard normal distribution. The parameters β are typically estimated using the maximum likelihood method. The results are:

T9. Information volume choices within the number scheme

	Vegetarian	**Label sufficiency**	**Age**	**Gender**	**Education**	**Members under 19**	**Household income**
Coefficient	-6.6	0.0	0.0	0.1	0.0	0.1	0.1**

The Log-likelihood function is -579.3 and the restricted Log-likelihood is -589.2. Pseudo R-squared is 0.02.

**: significant at the 95% confidence level.

This shows that respondents who have higher household incomes are more likely to prefer the high information volume format. This is consistent with the conclusions drawn above based on the pattern choices.

2) Scheme preferences

As shown above in table 4, almost half of the population prefers the number system. This section explores the selection among schemes using a multinomial logit model.

$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \varepsilon_i$

Y: system preference, value: 1(number), 2(percentage), 3(letter grade) and 4 (star).
X_1: vegetarian, value: 1 (yes), 2 (no).
X_2: label sufficiency, value: 1(yes), 2(no)
X_3: age, value: 19-96
X_4: gender, value: 1(male), 2(female)
X_5: years of education, value: 0-30
X_7: number of household members under the age 19, value: 0-10
X_8: gross household income, value: 1(less than $9,999), 2($10,000 to 19,999), 3($20,000 to 34,999), 4($35,000 to 49,999), 5($50,000 to 74,999), 6($75,000 to 99,999), 7($100,000 or more).

ε_i: Disturbance term

T10. Scheme choices (compared to number scheme)

	percentage	letter grade	star
Vegetarian	-1.0	28.8	29.9
Label sufficiency	-0.3*	-0.3	-0.2
Age	0.0	0.0	0.0
Gender	0.0	0.1	0.1
Education	0.0	0.0	0.0
Member under age 19	0.0	0.0	0.0
Household income	-0.2*	0.0	-0.1*

The Log-likelihood function is -1418.2 and the restricted log-likelihood is -1432.6 Pseudo R-squared: 0.01.
*: significant at the 90% confidence level.

This shows that compared with the number system, respondents who think the current label information is sufficient, and who have less household income, are more likely to prefer the percentage system. Respondents who have less household income are also more likely to prefer the star system. No definite pattern on the preference on letter grade system is found.

3) Preference consistency

As shown above in table 5, most people have consistent with their preferences (no difference or only a one level change). Personal characteristics may impact preference consistency. Because consistency is defined as the difference in preference between the information volume across the letter grade and star system, the dependent variable is ordered and integer valued (from -2 to 2). The model is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \varepsilon_i$$

Y: consistency measure, value:

-2 (switched from the highest level of information to the lowest level of information),

-1(switched from a higher level of information to a lower level of information, with one level difference),

0 (no change across two system),

1(switched from a lower level of information to a higher level of information, with one level difference),

2(switched from the lowest level of information to the highest level of information).

X_1: vegetarian, value: 1 (yes), 2 (no).

X_2: label sufficiency, value: 1(yes), 2(no)

X_3: age, value: 19-96

X_4: gender, value: 1(male), 2(female)

X_5: years of education, value: 0-30

X_7: number of household members under the age 19, value: 0-10

X_8: gross household income, value: 1(less than $9,999), 2($10,000 to 19,999), 3($20,000 to

34,999), 4($35,000 to 49,999), 5($50,000 to 74,999), 6($75,000 to 99,999), 7($100,000 or more).

ε_i: Disturbance term

T11. Preference Consistency

	Vegetarian	Label sufficiency	Age	Gender	Education	Members under 19	Household income
Coefficient	0.6	0.0	0.0	0.0	0.0**	-0.1	0.0

Log-likelihood is -1087.0 and the restricted Log-likelihood is -1091.0.

**: significant at the 95% confidence level

The results show that only the education level has a slight positive impact on preference changes. Therefore, we say the preference consistency is relatively independent across individuals.

Conclusions

Survey results permit the testing of certain theories and provides (partial) tested all the three hypotheses. In terms of information overload problem, the findings suggest that most people prefer a higher level of information, regardless of the information presentation format. When reporting plant hygiene performance on product labels, consumers want to be able to compare to the industry average.

The number system is preferred by a majority of population.

Consumers appear to be consistent in their preferences for the volume of information. The majority of the population is very consistent (no change across presentation schemes). This preference consistency pattern does not appear to be dependent on any evaluated consumer characteristic.

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Appendix 1. Current Literature Review for Food Label Project

How to present quality signals on product package
— A chronological review of the literature on consumer cognitive patterns on information

Authors	Focus	Design & Stimuli	Methods	Findings & Conclusions
George Miller, 1955	People's capacity of processing information	Experiments (tones, tastes, colors, etc.) to assess what is the amount of information people can process at one time	Theoretical Empirical	The span of absolute judgment and the span of immediate memory impose severe limitations on the amount of information that we are able to receive, process and remember. The process of recoding is a very important one in human psychology. The concepts and measures provided by the theory of information provided a quantitative way to solve the myth of number seven.
Debra Scammon, 1977	Examines the impact of information, which varies in number of dimensions and the complexity of format, on consumers' product evaluation decision.	Experiments (250 viewers, around 60 per cell) & 30-second commercial films about Skippy vs. Koogles) (18 nutrients*2 brands)	Empirical ANOVA	Data from an experimental study situation suggest that increasing amounts of information cause consumers to divide their processing time among the pieces of information presented causing an apparent information overload. Simplified information enables more accurate identification of the objectively best brand but leaves subjects feeling dissatisfied and desiring more information.
James Bettman, & Pradeep Kakkar, 1977	Examines the effect of information presentation format on consumers' information acquisition strategies.	2 experiments (150, 50 housewives; 50 per cell) & cereals (13attributes*11brands)	Experiments ANOVA	Consumers' acquisition patterns are strongly affected by format. Information is processed in the fashion which is easiest given the display used. This implies that studies of the properties of consumer tasks are needed, and that information must be presented to consumers in formats which facilitate processing.
Daniel Kahneman &	How people manage risk and uncertainty	Experiments (assigned monetary values to	Theoretical with strong	Raised an alternative for traditional expected utility theory. People's attitudes toward risks concerning gains may be

Amos Tversky, 1979		different binary options presenting to people)	empirical support	quite different from their attitudes toward risks concerning losses.
Gabriel Biehal, Dipankar Chakravarti, 1982	Examines how learning goals and task structure affect (1)retrieval of product information from memory; (2) choice processes. Directed learning vs. choice task.	Experiment (108 college students, 12 subjects per cell) & 4 brands of toothpaste	Experiments ANOVA	Significantly different processing patterns in both memory-retrieval and choice stemming from the experimental manipulations: Retrieval of information acquired under directed learning conditions (intent to make subsequent verbal reports to others) was primarily brand based, memory-retrieval of product information learned during nondirected learning (e.g. choosing products in a store or while watching TV) showed higher levels of attribute-based processing. In choice processing, consumers may focus only on information relevant to choice.
Peter Dickson, 1982	Examines the impact of internally and externally enriching concrete, case-history product information and abstract, statistical product information.	Experiment (171 women, 5-21 per cell) & refrigerator	Experiments MANOVA	Unlike previous research, which claimed case information to have a greater impact on judgments because it's more vivid and concrete, this paper found enriching information with detail or priming the subjects (case information) did produce distorted judgments that were higher than the correct judgments, compared with statistical information.
Scott Painton, James Gentry, 1985	Investigate further the nature of the format effect on information acquisition	2 studies (44 and 40 students, four cells)&Pocket camera	Experiments ANOVA	The way in which information is presented does affect how and how much information is sought. The tradeoff between the time thinking about the nature of a product's attributes and the time search for attributes. (Used Information Display Board (IDB), & computer interaction)
Jong-Won Park 1994	The way product information is organized in memory	3 experiments (72, 72, 92 students; 12 per cell, 12 per cell, 56/36 each cell)&color TV	Experiments ANOVA	People with an attribute-judgment objective organize the information in memory according to the attribute to which it pertained. People with an overall-evaluation objective also formed attribute-specific representations, as well as

				formed a more general, evaluation-based representation of the product as a whole.
Madhubalan Viswanathan, & Terry L. Childers, 1996,	How numerical and verbal information is processed and remembered following learning, judgment, and choice tasks.	2 experiments (40 students of each, 20 / cell) & calculator	Experiments ANOVA	Numerical information was found to require less processing time, recognized faster and more accurately, and recalled more exactly, than verbal information for a learning task. These processing and memory differences between numerical and verbal information can be reduced or eliminated by (a) presenting all information about an attribute either verbally or numerically so that both verbal and numerical information are equated on attribute specificity, and (b) presenting numerical information in the form of numbers on a rating scale so that it is similar to verbal information in terms of conveying meaning. The key to processing and memory differences between different types of magnitude information may lie in how specifically the magnitude information is linked to an attribute and also how readily it conveys meaning in an information processing context.
Tsiros, Michael, Mittal, Vikas 2000	A model of regret	A conceptual framework & 2 experiments (91 students randomly to 8 cells; 225 randomly to 16 cells) & laptops	Experiments ANOVA	Cognitive process underlies regret in the absence of information
Ariely, Dan 2000	Present consumers with information on which to base their decisions	A conceptual framework & 4 empirical studies (36 students, randomly to 2 cells; 40 students randomly to 2 cells; 144 students randomly to 4	Experiments	Controlling the information flow can help consumers better match their preferences, have better memory and knowledge about the domain they are examining, and be more confident in their judgments. However, it is also shown that controlling the information flow creates demands on processing resources and therefore under

		cells; 72 students randomly to 4 cells) &camera,		some circumstances can have detrimental effects on consumers' ability to utilize information.
Ahluwalia, Rohini 2000	Psychological Processes Underlying Resistance to Persuasion	Surveys (65 usable participants)	3 stage surveys (phone, interview, interview)	Committed respondents attempted to isolate the impact of the negative information to the target attribute, minimizing its spillover to the other attributes in the attitudinal representation in response to both easy and difficult to refute messages.
Alba, Joseph W., Hutchinson, J. Wesley. 2000	Knowledge Calibration: What Consumers Know and What They Think They Know	Conceptual	Review previous empirical studies	Review a wide variety of empirical results indicating that high levels of calibration are achieved rarely, moderate levels that include some degree of systematic bias are the norm, and confidence and accuracy are sometimes completely uncorrelated.
Purohit, Devavrat; Srivastava, Joydeep 2001	Effect of Manufacturer Reputation, Retailer Reputation, and Product Warranty on Consumer Judgments of Product Quality	A conceptual framework & 2 empirical studies (164 students, 19-22 per cell; 161 students, 19-21 per cell) & CompUSA	Experiments ANOVA	Warranty is not used in judgments of product quality when a manufacturer with a poor reputation sells directly to consumers or sells through a retailer with a poor reputation. However, when the same manufacturer sells through a reputed retailer, then the warranty is used in making quality evaluations. Highlights the important role that the retailer plays in assessments of product quality.
Jain, Shailendra Pratap; Posavac, Steven S. 2001	Prepurchase Attribute Verifiability, Source Credibility, and Persuasion	2 experiments (81 MBA students for both experiments)&two print ads for bike/camera	Experiments ANOVA	Source credibility impacts the receipt of experience claims and search claims differently. A source high in credibility can be employed to make experience claims more persuasive.
Gregan-Paxton, Jennifer 2001	The Role of Abstract and Specific Knowledge in the Formation of Product Judgments	4 experiments (204 students, randomly to 5 cells; 233 randomly to 12 cells; 33 to 2 cells; 177 to	Experiments ANOVA	The influence of specific knowledge was most evident when participants were able to construct an attribute mapping, but not a relational mapping, to link the novel product to a familiar brand exemplar. When it was

		12 cells) & calculators		possible to construct a relational mapping, a more abstract knowledge structure, such as a schema, was retrieved and used as the basis of product judgments.
Meyvis, Tom, Janiszewski, Chris, 2002	The Effect of Obviously Irrelevant Product Information	7 experiments (36 students randomly to 2 cells; 58 students to 8 cells; 47 students to 2 cells; 83 to 2 cells; 57 to 4 cells; 112 to 9 cells; 68 to 3 cells) & 8 different products/services: apt, delivery, frozen dinner, airline, toothpaste, car, stereo, computers.	Experiments	Consumers are selectively looking for information that suggests the product will deliver the desired benefit and that they categorize any additional evidence, be it irrelevant or disconfirming, as not confirming. As a consequence, irrelevant information weakens consumers' beliefs in the product's ability to deliver the benefit.
Areni, Charles S, 2002	The Proposition-Probability Model of Argument Structure and Message Acceptance	Conceptual		In the proposition-probability model (PPM) of argument structure and message acceptance, verbal arguments are decomposed into arrays of three types of propositions: (a) product claims, (b) data supporting those claims, and (c) conditional rules specifying the relationship between the data and the claims. The propositions making up a given argument can be stated, entailed, presupposed, conversationally implicated, and/or linguistically signaled. Message acceptance is based on the formation and/or modification of beliefs corresponding to the propositions in a given argument. For purposes of making precise predictions regarding the effectiveness of various argument structures, these beliefs are represented in terms of probabilities associated with each proposition.
Drolet, Aimee;	Cognitive-Based Attitudes	2 experiments (103, about	Experiments	Cognitive attitudes may be relatively impervious to

Aaker, Jennifer 2002		half to each of the two cells; 48, half to each cell)& shampoos,	ANOVA	persuasive appeals because the probability of targeting the specific attribute on which the cognitive attitude is based is smaller. Significant persuasion effects are found when the specific beliefs on which cognitive attitudes are based are taken into account. However, these effects only occur under conditions of low cognitive load and not high cognitive load where resources for the cognitive processing of the appeals are limited.
Ziamou, Paschalina (Lilia); Ratneshwar, S. 2002	The role of information in influencing perceptions of performance uncertainty of new product interfaces.	2 experiments (141 students, 37-39 per cell; 71 students, 17-19 per cell)& wireless device	Experiments ANOVA	More information is not always better in reducing performance uncertainty. High levels of information about the new interface actually intensify performance uncertainty when the product delivers a new functionality.
Diehl, Kristin; Kornish, Laura J.;Lynch Jr., John G. 2003	Study the situations when Lower Search Costs for Quality Information Increase Price Sensitivity	3 experiments (all are 64 students randomly to 12 cells, different assumptions)&e-birthday cards	Experiments ANOVA	Lowering quality search costs by smart agents can have the opposite effect on differentiation and price sensitivity. Smart agents screen through a universe of alternatives, recommending only a handful well-matched to the customer's quality preferences. Ordering can cause price and quality to increase or decrease depending on the slope of the price-quality relationship in comparison with the relative importance of price in the utility function.
Chernev, Alexander, 2003	The Role of Ideal Point Availability and Assortment in Consumer Choice	4 experiments (88 students randomly to 4 cells; 75 randomly to 4 cells; 67 randomly to 4 cells; 68 randomly to 4 cells)& chocolate assortments	Experiments ANOVA	Contrary to the common wisdom that more choice is always better, selections made from large assortments can lead to weaker preferences. in the case of large assortments, ideal point availability can simplify choice, leading to a stronger preference for the selected alternative. In contrast, for choices made from smaller assortments, ideal point availability is proposed to have the opposite effect, leading to weaker preferences.

Janiszewski, Chris; Silk, Tim; Cooke, Alan D. J., 2003	The Role of Subjective Scales and Experience in Explaining Attribute-Framing Effects	4 experiments (93 students randomly to 4 cells; 74 students; 35 students randomly to 4 cells; 85 students randomly to 8 cells)& 8 meat products	Empirical Experiments	Consumers respond more favorably to positively framed attribute information than to negatively framed attribute information. Framing effects also depend on the range and level of reference values used to evaluate attribute information. When the range of reference values is narrower for a positive frame than a negative frame, attribute values above expected performance levels favor the positively framed information and attribute values below expected performance levels favor the negatively framed information. When the range of reference values is wider for a positive frame than a negative frame, the opposite pattern emerges. Experience with a frame is one factor that reduces the range of reference values recruited to judge attribute information.
Lurie, Nicholas H., 2004	Decision Making in Information-Rich Environments: The Role of Information Structure	2 experiments (143 students; 27 students)&buying calculator online	Experiments, Monte-Carlo simulation	Today's consumers are often overloaded with information. Traditional approaches to measuring the amount of information in a choice set fail to account for important structural dimensions of information and may therefore incorrectly predict information overload. The amount of information processing mediates the relationship between information structure and information overload.
Kardes, Frank R.,Cronley, Maria L.,Kellaris, James J.,Posavac, Steven S. 2004	The Role of Selective Information Processing in Price-Quality Inference	4 experiments (118 students randomly to 12 cells; 56 students randomly to 2 cells; 161 students randomly to 4 cells; 62 students randomly to 8 cells)& questionnaires about 100	Experiments	Consumers are found to be less likely to neglect belief-inconsistent information and their quality inferences less influenced by price when concern about closure is low (vs. high) and information is presented randomly (vs. ordered) or a small amount of information is presented. Results provide a picture of a resource-constrained consumer decision maker who processes belief-inconsistent information only when there is

		top brands		motivation and opportunity.
Bradley III, Samuel D.; Meeds, Robert 2004	Examine the effects of sentence-level context, prior word knowledge, and need for cognition on responses to print ads for technical products	Experiment (179 people, randomly 145 to the experimental condition and 35 to the control condition) & magazine ads	Experiments ANOVA	Words and phrases that help readers understand technical language in context increased the supportive arguments generated in response to ads, whereas prior word knowledge and need for cognition primarily influenced neutral thoughts. Only explanatory language facilitated the comprehension of product information. Explanatory language led to an increase in attitudes and purchase intent. Need for cognition had a positive influence on attitude formation when the context language was ambiguous, but decreased attitude formation when the context language was explanatory.
Lee, Angela Y. 2004	The Prevalence of Metacognitive Routes to Judgment	Conceptual	Theory-based correction	When the target (e.g., brand name, logo, etc.) can be more easily processed, the hedonic experience of processing fluency gives rise to more favorable attitudes toward the target. However, when information about the target (e.g., an ad highlighting benefits of the brand) can be more easily processed, individuals may interpret the experience of processing fluency based on naive theory and attribute the experience to the information being more persuasive, resulting in more favorable attitudes toward the target.
Schwarz, Norbert 2004	Metacognitive Experiences in Consumer Judgment and Decision Making	Conceptual	Naïve Theory	What exactly people conclude from a given metacognitive experience depends on the naive theory of mental processes they bring to bear, rendering the outcomes highly variable. The obtained judgments cannot be predicted on the basis of accessible declarative information alone; we cannot understand human judgment without taking into account the interplay of declarative and experiential information.

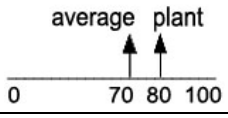
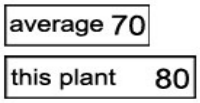
Cronley, Maria L.; Posavac, Steven S.; Meyer, Tracy; Kardes, Frank R.; Kellaris, James J., 2005	Perspective on Price-Quality Inference and Inference-Based Choice	5 experiments (275 students, randomly assigned to 8 cells; 75 students randomly to 4 cells; 56 students randomly to 4 cells; 58 students, randomly to 8 cells; 56 people)& wines	Experiments ANOVA	Quality inferences are more heavily influenced by price when individuals have a high need for cognitive closure, when the amount of information presented is high (vs. low), and when the information presented is rank ordered in terms of quality rather than presented randomly. Furthermore, because consumers are willing to purchase more expensive brands when they perceive a high price-quality correlation, these variables can also influence their purchase decisions.

Appendix 2. 2006 Ohio Survey of Food, Agriculture, and Environmental Issues

Due to the risk of foodborne disease and bio-terrorism, information may soon appear on retail beef packages communicating the hygiene quality of the production plant that processed the beef product. A score ranging from 0 to 100 would be assigned to each production plant, with a higher score meaning better hygiene at the plant. Production plants that do not meet minimal hygiene standards would be forced to close and improve their operations. All beef products allowed to be sold in the market would be considered safe to consume.

There are several ways a hygiene score might be presented on a food label. <u>For each system of labeling identified below, please check the box associated with the option you most prefer.</u>

a. A **<u>Number System</u>** identifies the hygiene score, from 0 to 100, of the production plant from which the product originated. Among the three sample labels, below which do you prefer?

□ Option One	□ Option Two	□ Option Three
Hygiene Quality 80	**Hygiene Quality** 	**Hygiene Quality** 

b. A **<u>Percentage System</u>** identifies the relative hygiene performance of the production plant from which the product originated, compared with the industry. Among the three sample labels, which do you prefer?

□ Option One	□ Option Two	□ Option Three
Hygiene Quality **80%** **10% higher than the industry average**	**Hygiene Quality** **Top 30%** **of the industry**	**Hygiene Quality** **115% of** **the industry average**

c. A **<u>Letter Grade System</u>** identifies a letter grade, ranging from "A" to "D", which is based on the hygiene score of the production plant from which the product originated. With this system, an "A" indicates the product was from a plant with the highest hygiene performance while a "D" indicates the plant minimally met acceptable hygiene standards. Among the three sample labels, which do you prefer?

□ Option One	□ Option Two	□ Option Three
Hygiene Quality **B**	**Hygiene Quality** **B** **industry average C**	**Hygiene Quality** **B** **satisfactory**

d. A **<u>Star System</u>** identifies from one to four stars, based on the hygiene score of the production plant from which the product originated. With this system, four stars indicate the product was from a plant with the highest hygiene performance while one star indicates the plant minimally met acceptable hygiene standards. Among the three sample labels, which do you prefer?

□ Option One	□ Option Two	□ Option Three
Hygiene Quality ★★★☆ satisfatory	**Hygiene Quality** ★★★☆ (industry average ★★☆☆)	**Hygiene Quality** ★★★☆