Information Integration in Consumer Risk Perception: A Comparison of Two Models of Component Conceptualization

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Rules used for integrating components of risk into an overall risk rating were examined for 60 subjects using Anderson's 1970 information integration methodology. Thirty subjects received stimuli based on a model of risk components developed by Bettman and 30 received stimuli based on Cunningham's conceptualization. Results indicated that the theoretically expected combination rule, multiplication of components, was not upheld for either model. The Bettman model, although graphically displaying a diverging fan (multiplicative combination), showed a significant ($p < .01$) residual interaction after the bilinear portion of the interaction was removed. The Cunningham model showed a converging graphical pattern opposite to that expected, supporting a differential weighted averaging model. The development of a theoretical basis for models of consumer risk perception is proposed as a necessary step for future research.

Although the concept of perceived risk has been prominent in consumer research for a relatively long time (Bauer, 1967), there has been little research directly examining the conceptualization of the model. The purpose of this study was to provide (a) a comparison of different schema for specifying the components assumed to comprise overall perceived risk and (b) an examination of the multiplicative relationship assumed for combining the components.

There are two main studies in the marketing literature that have developed schema for specifying the components of risk: Cunningham (1967) and Bettman (1973). Cunningham specified these components as certainty and consequences, with consequences operationalized as danger in trying a brand not used previously. Bettman developed a model of risk which utilized as components the percentage of brands falling above an acceptable level of quality for a consumer and the importance of making a satisfactory brand choice within the product class. These two conceptualizations, although certainly similar, do differ, and no direct comparison of the two has been carried out.\(^2\)

It has usually been assumed that the components are multiplied to arrive at an overall rating of risk. Although appealing theoretical arguments can be made for a multiplicative relationship (namely, that the absence of either importance or uncertainty would eliminate risk, Hansen, 1972), there has been little empirical testing of the assumed relationship. Cunningham (1967) and most others (e.g., Copley & Callom, 1971) simply assumed multiplication. Bettman (1973) tested linear and multiplicative formulations with a regression approach and found little difference in terms of degree of fit. Research in risk taking in psychology has also been equivocal, with support for both linear (Lanzetta & Driscoll, 1968) and multiplying (Anderson & Shanteau, 1970) relationships. This issue interacts with the previous issue, since how the components are conceptualized may affect how they are combined.

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\(^1\) Related research has dealt with the decomposition of risk into types of risk (e.g., Jacoby & Kaplan, 1972). In addition, there is a large body of work in psychology on betting and risk-taking behavior (e.g., Anderson & Shanteau, 1970; Lanzetta & Driscoll, 1968). However, these areas are somewhat tangential to the issues considered in this paper.

\(^2\) Bettman (1973) found average correlations of .37 between percentage acceptable and certainty, and .45 between danger and importance over nine product classes for 121 subjects.
METHOD

In examining the two issues raised above, the experimental methodology developed by Anderson (1970, Note 1) to study information integration was utilized (see also Anderson, 1974; Bettman, Capon, & Lutz, in press). This approach is based upon presenting subjects with pieces of information on risk components which are to be combined into an overall risk judgment. The specific rules used by subjects to combine the stimulus information, their cognitive algebra, can then be examined in detail. For example, subjects might appear to add, average, or multiply the components. Experimental approaches have rarely been used in studying consumer risk perception (Ross, in press); however, to understand the information integration carried out by consumers, experimental manipulation is more appropriate than typical correlational approaches (Anderson, 1972; Birnbaum, 1973).

Risk Profiles

The subject's task was to judge the overall inherent risk in purchasing a brand in a particular product class after examining a risk profile for that product class. Subjects were presented with a series of risk profiles. Each profile contained two risk components for consideration along with assigned levels for each component. There were two separate sets of risk profiles, one utilizing the Bettman (1973) schema for specifying risk components; the other utilizing the Cunningham (1967) schema. The specific form of the profiles is presented below.

1. For the Bettman task:

   You feel that: about [5%, 35%, 65%, 95%] of the brands in this product class would be acceptable to you if you were going to use them, and it is [not at all, somewhat, moderately, very] important to you that you choose the most satisfactory brand in this product class.

   To you, choosing a brand of this product class in the imaginary store would be:

   Not risky at all 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  Exceptionally risky

2. For the Cunningham task:

   You feel that: you are [almost never, sometimes, usually, very] certain that a brand of this product class you haven't tried will work as well as your present brand, and compared to other products, you feel there is [no, not much, some, a great deal of] danger in trying a brand of this product class you never tried before.

   To you, choosing a brand of this product class in the imaginary store would be:

   Not risky at all 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  Exceptionally risky

Overall inherent risk was measured by the imaginary store method developed by Bettman (1973). For each task, four levels were used for each component,\(^\text{8}\) generating 16 profiles, and therefore a complete $4 \times 4$ factorial design in which each component was a factor.

Subjects and Procedure

The subjects, 60 undergraduate students, were run in groups, with each subject receiving a questionnaire to complete. The subjects were randomly assigned to the two tasks by randomly arranging the questionnaires, with half of the subjects receiving the Bettman task and half receiving the Cunningham task. Each questionnaire began with a warm-up task to acquaint subjects with the components utilized in the task (Anderson, 1974). Each subject rated component levels and overall inherent risk for four product categories. This familiarized the subjects with the concept of risk components and with the specific levels used for each, as well as with the use of the 15-point risk scale.

Subjects were next given the profile rating task. Instructions for the profile rating task specifically emphasized that subjects were rating a hypothetical product, not one of those rated earlier; that is, they were asked to consider how they might use information on the two components for products in general. In addition, subjects were told that the two pieces of information in the profile (component levels) were intended to represent their own feelings about the components, not someone else's.

Then, following an example profile, subjects were presented with two replications, or 32 profiles in all, of the $4 \times 4$ factorial design. Profiles were typed, four to a page. In an attempt to anchor the response scale, the 15-point risk scale used extreme verbal anchors, and the two "extreme" profiles were given first (e.g., "you are almost never certain" and "there is a great deal of danger"). Order of the remaining profiles was randomized. Finally, subjects were asked to describe the procedures they had used for combining the components. Subjects were allowed approximately 30 min to complete the questionnaire. This methodology does depart from that used by Anderson (1970, Note 1) in that the replications were given at the same sitting rather than on different days, and group administration was used. However, in the interests of obtaining more subjects than typically used by Anderson, these procedures were felt to be adequate.

Analysis of Information Integration Rules

Anderson (1970, Note 1) has developed in detail methods for classifying the specific type of integration rule subjects appear to have used, so only a brief outline is presented here. There are two main models of risk of interest in this study—adding and multiplying of components to obtain the overall risk rating. Be able for other components para for a more multiplicity of strain see this, expected multiplying m from one tests when the fact subject is would be and not would be in the interaction (linear) to be of freedom, with 1 d 8 degree of freedom, is significant not dist. which is model w converg.

Graphs

The risk rat 1. Not the ho

\(^8\) The certainty and percentage acceptable components were coded so that Level 1 was the most certain and Level 4 the most uncertain.
FIGURE 1. Mean risk judgments for the Bettman and Cunningham tasks. (Note that importance and danger are spaced on the horizontal according to their functional measurement subjective values.)

rating. Both graphical and statistical tests are available for determining model type. If the factorial or component data are graphed, an adding model implies parallelism in the data plot. On the other hand, for a model in which positive components are being multiplied, the plot should look like a diverging fan of straight lines, with a distinct nonparallelism. (To see this, one may plot the responses theoretically expected if subjects followed an adding or multiplying model exactly, with each component scaled from one to four.) There are also exact statistical tests available based on analysis of variance of the factorial data, both at the group and individual subject level. An adding model for the components would be characterized by significant main effects and no significant interaction. A multiplying model would imply significant main effects and a significant interaction concentrated in the Linear × Linear (bilinear) component of the interaction. Thus the total sum of squares for interaction, with 9 degrees of freedom, can be partitioned into the bilinear term with 1 degree of freedom and a residual term with 8 degrees of freedom. The appropriate test, therefore, is for a significant interaction, and a nonsignificant residual interaction. Note that this test will not distinguish between a diverging fan of lines, which is assumed by the algebraic form of a risk model which multiplies positive scale values, and a converging fan of lines.

RESULTS

Graphical Analysis

The effects of the two components on mean risk ratings for each task are shown in Figure 1. Note that the components are spaced on the horizontal axis according to the subjective scale values obtained by functional measurement procedures (Anderson & Shanteau, 1970). This allows a rough graphical assessment of whether or not subjects follow a multiplying model. Recall that if a multiplying model is being used, a diverging fan of straight lines should result. For the Bettman task, there is a slight diverging fan but also a hint of nonlinearity in the lines for each level of percentage of acceptable brands. For the Cunningham task, there are hints of a problem with the formulation; the lines tend to converge, rather than diverge, particularly for the first three levels of certainty. The deviations from parallelism do not appear large, however, so statistical analysis was undertaken to more rigorously examine the results.

Statistical Analysis

A first analysis was made at the group level, with results shown in Table 1. Note that in both tasks the main effects and interactions are significant at $p < .05$. Analysis of the interaction term at the group level to assess whether the multiplying model holds is complex; Anderson develops the methodology needed in detail, so it is not presented here (Anderson, Note 1, pp. 25–30). For the Bettman task the bilinear component approached significance, $F(1, 29) = 3.94, p < .06$. However, as Figure 1 suggests, the residual interaction was significant, $F(8, 232) = 4.13, p < .01$. Thus, there are significant nonlinear deviations from the multiplying model, although the graphical results show they are not substantial. For the Cunningham task, the bilinear component was significant, $F(1,
TABLE 1
SUMMARY ANALYSIS OF VARIANCE FOR BETTMAN AND CUNNINGHAM TASKS

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bettman task</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Importance (I)</td>
<td>3</td>
<td>130.48**</td>
</tr>
<tr>
<td>Percentage acceptable (PA)</td>
<td>3</td>
<td>88.47**</td>
</tr>
<tr>
<td>C x D</td>
<td>9</td>
<td>4.02**</td>
</tr>
<tr>
<td>Cunningham task</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger (D)</td>
<td>3</td>
<td>161.94**</td>
</tr>
<tr>
<td>Certainty (C)</td>
<td>3</td>
<td>57.51**</td>
</tr>
<tr>
<td>C x D</td>
<td>9</td>
<td>1.99*</td>
</tr>
</tbody>
</table>

Note. Listed degrees of freedom are for the numerator. Each source has its own error term with 29 times as many degrees of freedom.
* * p < .05.
** ** p < .01.

29) = 5.19, p < .05, and the residual component was nonsignificant, F(8, 232) = 1.46. Thus the statistical tests for multiplying are met; however, as mentioned above, there is a serious deviation from expectations in the graphical results with the converging fan form.4

DISCUSSION

Thus, the results from both tasks are ambivalent. The Bettman conceptualization does not show a strong diverging fan and yields a significant residual interaction. The Cunningham conceptualization shows a converging fan of straight lines. One might argue that the convergence in the Cunningham task is a more serious theoretical departure. There are theoretical reasons for expecting risk components to multiply (Hansen, 1972). If the formulation is, theoretically, Risk = Uncertainty x Danger, and if both uncertainty and danger are measured on positive scales, then the expectation from the algebra of the model is that there will be greater effects of uncertainty at the higher levels of danger, that is, a diverging fan. However, in the Cunningham

4 Although two replications may be inadequate, individual level analyses were performed. In the Bettman task, 23 subjects appeared to add, 3 to multiply, and 4 used some other pattern. In the Cunningham task, 22 appeared to add, 5 to multiply, and 3 fell into other patterns. Thus the individual level results, although they must be interpreted cautiously in light of the small number of degrees of freedom for error (16), only add to the lack of confirmation for the models in both cases.
ill-defined concept with ad hoc underlying component conceptualizations and assumptions. Future consumer research using risk seems fruitless unless some of the major conceptual problems raised are dealt with.

REFERENCE NOTE


REFERENCES


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