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The ADE scales: measures of accuracy, difficulty, and effort for evaluating decision aids and information formats

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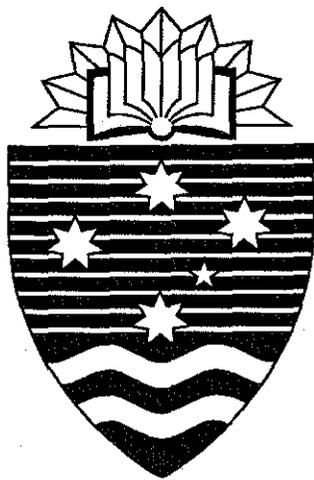
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**"The ADE Scales: Measures of Accuracy,
Difficulty and Effort for Evaluating Decision
Aids and Information Formats"**

by

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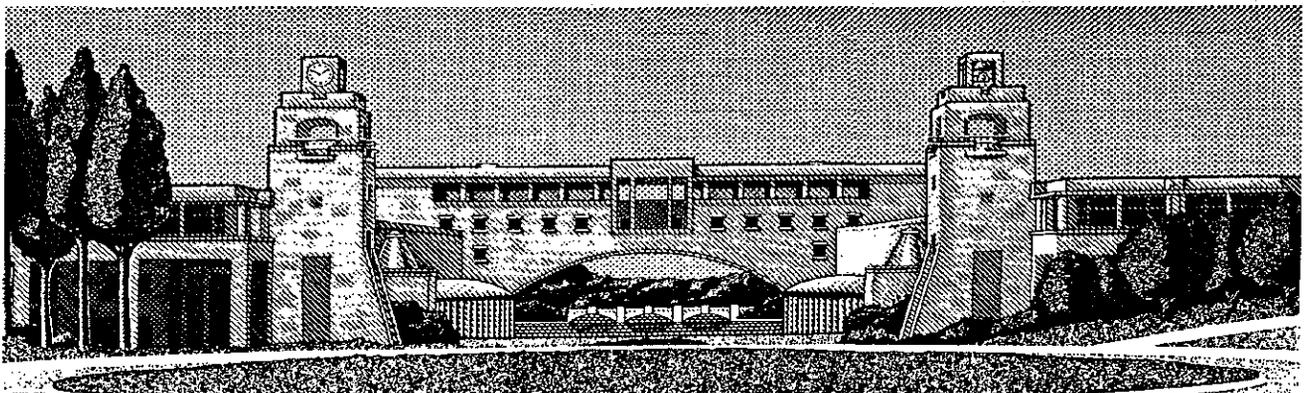
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B O N D U N I V E R S I T Y

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The ADE Scales: Measures of Accuracy, Difficulty, and Effort for Evaluating Decision Aids and Information Formats

Abstract

Three scales measuring decision maker evaluations of decision aids and information provision formats were evaluated. The scales measured perceived decision accuracy, effort put into the decision process, and difficulty experienced during the decision process. Psychometric analyses indicated the scales were unidimensional, reliable, and exhibited evidence of nomological validity. The scales were, therefore, recommended to researchers and information providers studying the efficacy of decision aids.

Introduction

A thorough, carefully considered purchase process is more the exception, rather than the rule, as decision makers often fail to live up to the assumptions of economic man. Far from having carefully analyzing all available information and deciding upon the highest utility option, research has chronicled the apparent lack of effort put into decision making by consumers, even in cases of expensive and important purchases (Newman and Staelin 1972; Claxton, Fry and Portis 1974; Kiel and Layton 1981; Westbrook and Fornell 1979; Maynes and Assum 1982; Beatty and Smith 1987). This seemingly "irrational" behavior has commonly been attributed to bounded rationality (Simon 1955), information overload (Billings and Marcus 1983; Lussier and Olshavsky 1979; Malhotra 1982; Payne 1976), and not operationalizing the costs of information search and analysis into the utility function (Stigler 1961; Shugan 1977; Russo et al. 1986).

Information acquisition and decision aids have been advocated as a means of reducing the odds of making a poor decision and their economic consequences (Beales et al. 1981; Widing and Talarzyk 1989). Of particular interest here are aids that help in the analysis of product quality information, such as that found in *Consumer Reports*. Decision aids which can provide ready access to and help analyze product information and ratings, may help consumers make better decisions with less time, effort and difficulty than has previously been the case. The capability of decision aids to help consumers, however, hinges in large part on their acceptance by users. A key determinant in decision aid usage are the subjective evaluations of the aid by users. Decision aids, no matter how effective at improving decisions, will be limited in their diffusion if they are not seen as useful and reasonably easy to use by the people they are designed to help (Russo et al. 1986). In short, users should like and be satisfied with the decision aid they use.

No validated and reliable measures of consumer evaluations of information formats and/or decision aids, however, have been reported in the literature. Instead, single items or

scales that have not been subjected to rigorous psychometric analyses have been used in previous research (Widing, et. al. 1986, Widing and Talarzyk 1991, Russo, et. al. 1986, Bettman and Zins 1979). The goal of this paper is the development of a valid and reliable multidimensional scale for this purpose. The developed scale should provide a useful tool for decision aid researchers and information providers, as they attempt to evaluate the promise of information acquisition and decision aids.

Dimensions of Interest in Measuring the Efficacy of a Decision Aid

Two dimensions have been identified in past research as being of key importance in evaluating a decision process. These include the quality or accuracy of the decision and the effort expended in making the decision (Bettman and Zins 1979; Keller and Staelin 1987; Klien and Yadev 1989; Russo et. al. 1986; Widing et al. 1986). Indeed, these dimensions are interrelated as a tradeoff has been assumed to exist between them. We contend, however, that a third dimension, the difficulty encountered in making a decision is also key, especially in the case of aided decision making. To be effective, decision aids should help reduce the difficulty experienced during choice, thereby reducing effort and enhancing accuracy; that is, both reducing effort and improving accuracy might be simultaneously attained through the reduction of difficulty. Hence, this third dimension is particularly important to add in the study of decision aids. This paper, in developing measures for these three dimensions, will largely follow the scale development paradigm of Gerbing and Anderson (1988). First though, the following section details the theoretical underpinnings of the dimensions by reviewing the literature.

Perceptions of Difficulty and Effort

Simon (1955) coined the term "bounded rationality" to describe the processing limitations of decision makers. Unlike the assumptions of economic-man theory, where unlimited processing capacity is assumed, people are willing and/or capable of processing only a limited amount of information in a given time span. This presents a serious problem for buyers, as the number of available alternatives in many product categories can number in the hundreds, with raters of product quality frequently evaluating 30 or more brands (Widing and Talarzyk

1988). This is further complicated by the fact that those same products can be judged on numerous attributes, creating a dizzying matrix of information to process (Pittle 1984).

Decision makers might avoid information overload by taking the first acceptable alternative (Simon 1955) or by resorting to non-compensatory heuristics when confronted with difficult and burdensome levels of information (Olshavsky 1979; Payne 1976; Billings and Marcus 1983; Klein 1983; Jacoby 1984). By using these heuristics (or shortcuts), decision makers can reduce the choice set down to a more manageable level. Upon reducing the choice set, they have been observed to revert back to compensatory processes to more fully analyze the information on the remaining alternatives. In certain difficult decision environments (e.g., ones with large amounts of information and negative correlations), however, this use of noncompensatory heuristics can result in the inadvertent elimination of what would have been more preferred alternatives, resulting in less than optimal decisions (Widing and Talarzyk, 1986, 1991). Hence, the potential for a trade-off between effort and accuracy exists, especially with difficult environments. It is, therefore, of interest to measure perceptions of the three dimensions for a decision task.

Widing and Talarzyk (1991) developed a three item scale to measure subjective reactions of the difficulty experienced during choice while using decision aids/formats. The items selected were generated in earlier research on information formats and/or information load (Bettman and Zins 1979; Malhotra 1982; Keller and Staelin 1987; Klien and Yadev 1989; Widing et al. 1986). Pre-testing revealed that three items, measuring confusion, frustration, and difficulty experienced during the decision process, adequately measured the "difficulty experienced during choice" dimension. Their study found that the items loaded strongly on the hypothesized factor and were found to be highly reliable. Small crossloading on another factor representing accuracy supported the construct validity of the difficulty factor. In addition, the reliability of the scale was high. Widing and Talarzyk, however, did not contend they had confirmed the properties of the scale, but simply reported the results of an exploratory factor analysis along with their substantive results.

A dimension not measured by Widing and Talarzyk (1991) was decision making effort. When faced with a difficult task, the decision maker has the choice of either increasing his/her mental effort to overcome the difficulty, or scaling back the effort and being satisfied with a potentially less than optimal outcome. The lower mental effort route appears to be prevalent, as the evidence cited above suggests that many decisions are made with effort reducing heuristics. Stigler (1961) explained this apparently "irrational behavior" by noting that the time and effort required to gather and analyze information is not costless. That is, there are trade-offs between the costs of a more thorough decision process and the benefits of making a better decision. Russo, et. al. (1986) contend that reducing effort is more important in increasing information usage than extolling the accuracy benefits and exhorting consumers to engage in greater amounts of information search and analysis. Mental effort expended/required during decision making, therefore, would appear to be an important dimension in which to have users evaluate decision aids. This is different from the difficulty dimension, since people may or may not increase effort in response to their experiencing difficulty during the choice task. A decision aid that reduced the effort required to deal with a difficult decision environment, would seemingly be better liked and consequently more likely to be used.

Perceptions of Decision Accuracy

Several research efforts have attempted to measure user perceptions of a decision aid's ability to help them make a better decision (Aldag and Power 1986; Widing et al. 1986; Widing and Talarzyk 1991). Widing and Talarzyk (1991), in attempting to measure decision quality, reviewed items developed in earlier work by Klein and Yadev (1989), Keller and Staelin (1987), Malhotra (1982), Bettman and Zins (1979), as well as their own earlier work, to come up with a three item decision quality scale. The three items, which measured perceptions of choice accuracy, confidence the best choice was made, and certainty of choice, were studied along with the difficulty dimension noted above. Support for construct validity was provided as the items loaded heavily on one factor, with small crossloading on the previously described difficulty dimension. The items also proved to be reliable.

Research has shown that computerized decision aid users have a great deal of confidence in the ability of the aid to provide them with a high quality decision: unfortunately, this faith in the decision aid has not always been justified, as decision making performance has not been helped and sometimes been hurt with an aid, than when subjects made unaided decisions (Aldag and Power 1986; Widing et al. 1986; Widing and Talarzyk 1991). Efforts to assess subjective perceptions of their choice accuracy using the aid were handicapped in these studies, therefore, by the fact that subjects were not given feedback as to their decision mistakes before making their accuracy assessments. Therefore, we intend to study the scales' nomological validity by assessing perceptions of accuracy both before and after feedback on decision quality has been provided to users.

Dimension Context and Summary

Widing et al. (1986) found in a pilot study that the context in which subjective reactions were assessed was an important aspect in developing sensitive measures. When no basis for comparison was provided, the measures did not discriminate among different decision aids on subjective evaluations. When the questions were framed in the context of comparing the computer assisted format to having the same brand information presented in alphabetical order on a sheet of paper (e.g., a magazine page), decision aid format differences were found. Therefore, a common benchmark for subjects to compare their formats against was important in attaining sensitive measures. Further, an alphabetical ordering is a standard non-assisted method of presenting information. We therefore use their framing of the items for all three dimensions.

In summary, unidimensionality of the difficulty and accuracy dimensions were not studied in a confirmatory manner by Widing and Talarzyk (1991), nor was nomological validity addressed. Further, the "effort" dimension was not used at all. Finally, measures taken before and after feedback on decision quality has been given are useful for addressing nomological validity. In the remainder of this paper we attempt to shore up these deficiencies.

Scale Development

An experimental setting, using three computer assisted decision aids was utilized to test the validity and reliability of the scale items. Student subjects (n=215), from a large midwestern university, were randomly assigned to sections using one of the three decision aids. The three formats were: (1) the LINEAR, in which the brands were ranked based upon a weighted average using user specified attribute importance weights; (2) the CUTOFF, a non-compensatory format in which the user set minimum attribute scores and only brands exceeding each specified cutoff were presented; and (3) the EQUAL WEIGHT, a non-interactive format in which brands were ranked based on a summary score from an equal importance weight model. All formats presented the individual attribute scores in a brand by attribute matrix.

The junior and senior level student subjects, from a large midwestern university, were trained on the use of the format, following a procedure developed by Widing et al. (1986, 1991). Questioning of the subjects following the training revealed high levels of competency and confidence. After training, subjects were asked to use the aid to help them select their favorite brand of word processing software from a group of 30 brands that were evaluated on six attributes (from *Software Digest Rating Newsletter*). Immediately after they made their initial best choice, the questionnaire with the scale items was provided.

In order to provide the subjects feedback about any decision errors they may have made, they were asked, following the choice task, to compare their chosen brand in a paired fashion with 6 other brands, which had proven to be the most preferred brands in pre-testing. Subjects were told they could switch to any of the 6 brands or stay with their original choice. After completion of the paired comparisons, they were again asked to assess the decision aid's ability to reduce the difficulty of the task, the effort required to complete the task, the (perceived) time of the task, the accuracy of the decision, and their overall satisfaction with the format. The frame of reference used was "in comparison to a format presenting the same information, but with brands listed in random order on a sheet of paper" (random order was used instead of alphabetical order since nonsense syllables were used to identify brands). We only report on the

latter administration of the scales, although the results from the initial administration were similar.

The items developed in the exploratory study by Widing and Talarzyk (1991) were used to assess the difficulty (Items # 1, 4, and 8 in Table 1) and accuracy (Items # 3, 7, and 9 in Table 1) dimensions. Three items were also developed here, using the same literature cited earlier for the difficulty and accuracy dimensions, to measure the effort dimension. The three items measured the amount of "thinking", "mental effort" and "thought" required to complete the decision task, (Items # 5, 6 and 10, Table 1).

Unidimensionality

Although unidimensionality cannot be established with an exploratory factor analysis alone (Gerbing and Anderson 1988), we provide the results of this analysis for comparison purposes with the results of Widing and Talarzyk (1991). The items were first subjected to a common factor analysis, using a maximum likelihood extraction with an oblique rotation (oblimin). The pattern matrix indicated that the items for each factor loaded strongly on the hypothesized dimensions, with the lowest loading being .66 (see Table 2 for all unidimensionality results). The cross loadings were also reasonably low, with the highest load being .25, and 16 of 18 cross loadings being .10 or below. These results are consistent with those of Widing and Talarzyk (1991) on the difficulty and accuracy dimensions.

The eigenvalues (accuracy = 4.64; effort = 1.96) and variance explained (accuracy = 51.6%; effort = 21.7%) were high for two factors, but somewhat low for the difficulty dimension (eigenvalue = .70; variance explained = 7.7%). This differs from Widing and Talarzyk's results, in which the difficulty dimension had an eigenvalue of greater than one. Nevertheless, the scree plot showed a dropoff and flattening after the third factor. Since a strong theoretical basis, as well as previous empirical evidence exists for the difficulty dimension, it will be retained and all three dimensions subjected to a confirmatory factor analysis. A chi-square test of the difference between a two (without difficulty) and three factor model will then be performed to determine if the model performance is better with or without the difficulty

dimension. Since no items were found to be deficient using the common factor analysis, all will be retained for the confirmatory analysis.

The three factor restricted (confirmatory) analysis was performed using EQS. The correlation matrix was analyzed using a maximum likelihood solution. Each item was set to load only on its own factor and the factors were allowed to correlate. The overall chi-square was significant at $p=.05$ (chi square = 37.95, 24 degrees of freedom, $p = .035$). Due to the fairly large sample size ($n=215$), however, this is not unexpected. Further, the moderate chi-square relative to the degrees of freedom suggest an acceptable fit to the data. The Bentler-Bonett (B-B) non-normed fit index is .983, and the B-B normed fit is .970. The error is low, as indicated by the average absolute standardized residuals (ASR) of .027 and the average off-diagonal ASR of .034. The largest individual standardized residual was .089, indicating very low error. The loadings for each item ranged from .76 to .88, with all T values exceeding 12 ($p<.001$). These results exceed those for establishing that the constructs are well measured and achieved unidimensionality (Bagozzi and Yi 1988).

Finally, there was some concern stemming from the exploratory factor analysis about the value of a separate difficulty dimension. A chi-square test of differences, therefore, was conducted. This was done by running two models, the first model set difficulty and accuracy to one and the second model set difficulty and effort to one, and comparing the resulting differences between the full three factor model with these two alternative models. The difference between the base line three factor model (statistics above) and each of the two alternative models was highly significant (model 1: chi-square = 128.1, $df = 25$, change in chi-square = 90.20, change in $df = 1$, $p < .001$; model 2: chi-square = 215.5, $df = 25$, change in chi-square = 177.5, change in $df = 1$, $p < .001$). This analysis of discriminate validity supports the retention of a unique difficulty dimension.

Nomological Validity

For a scale to satisfy the requirements for nomological validity, it should behave in an expected manner in relation to other events/measures. The following expected relationships are

examined. First, we expect effort and difficulty to be related to the number of brands thoroughly evaluated. The literature indicates that the greater the amount of information processed, the greater the complexity of the task (Malhotra 1982, Payne 1982, Russo, et al. 1986). Hence, those thoroughly processing large numbers of brands would also be expected to report greater levels of effort and difficulty during choice than those who process fewer.

Although accuracy might also be expected to increase with increases in the amount of information thoroughly processed, there seems to be a point at which the information load becomes too large and people are less able to cope with the demands of the task. Research has placed the number of alternatives at which "dysfunctional effects" (e.g., confusion and frustration) occur at roughly 10 or more brands (c.f., Malhotra 1982). Therefore, we do not attempt to measure the accuracy dimension since we cannot necessarily assume that thoroughly evaluating large numbers of brands necessarily enhances perceived decision quality.

We use a self report measure of the number of brands thoroughly evaluated by subjects to establish a break point to create two groups. This break point was set at 10 brands (the onset of dysfunctional behavior).

Subjects who reported "thoroughly evaluating" more than 10 brands reported significantly higher levels of perceived difficulty and effort than those subjects who evaluated 10 or fewer brands, as would be expected (Table 3).

Nomological validity for the effort constructs could also be established by showing a relationship with the time spent on decision making, since time has been used as an indicator of effort (Bettman and Zins 1979). Higher effort should be associated with more time, while lower effort should be associated with less time. While previous research, by Widing and Talarzyk (1991), showed that decision aid user's perceptions of the time they spent using the aid to make a decision were not necessarily accurate indicators of the actual time spent using the aid, perceived time should be associated with perceived difficulty and mental effort (see item 2, Table 1). Difficulty may or may not be associated with more time, since users confronted with a difficult

task could use satisficing behavior to reduce time or spend more time to overcome difficulty; hence, this construct was not tested using perceived time.

The effort constructs would also be expected to be related to the measure of perceived time spent making the decision. Those that felt their perceived decision making time was not reduced by the decision aid (scores 4 and greater on a 9 point scale), had significantly higher levels of perceived effort than those whose perceived time was reduced (scores 3 or less).

Third, the accuracy construct should also have a relationship with actual decision quality, for nomological validity to be established. As was noted earlier, computer assisted decision aid users have a great deal of confidence that a computer will ensure that they will choose the best alternative. Actual decision quality results, however, do not support this confidence in difficult decision environments, leading to inaccurate accuracy perceptions in prior research, since measures of choice accuracy have been acquired prior to subjects' receiving feedback on decision errors (Widing and Talarzyk 1991). For convergent validity of the accuracy construct to be established, decision aid users need to have been exposed to their decision mistakes (if they did make a mistake), before evaluating the aid's ability to help them make a accurate (high quality) decisions. This was accomplished, for this research, by allowing subjects to evaluate the decision aid after they had gone through a process of comparing their computer decision aid assisted choice with six other top brands. After comparing their brand with the comparison brands they were allowed to switch to any of the comparison brands, indicating a potential decision error, or stay with their original choice.

Table 3 presents the accuracy measure's relationship with the decision quality measure (switching behavior). The pre-comparison/switching accuracy assessments for both switchers and non-switchers was not significantly different, as expected. The post-comparison/switching assessments of accuracy between switchers and non-switchers, however, were marginally significantly different ($p < .10$, 1-tail). The mean for the non-switchers remained virtually the same as the pre-comparison mean, while it increased for switchers, providing evidence of convergent validity for the accuracy dimension measures.

The fourth analysis of nomological validity examines effort, difficulty and accuracy dimensions in relation to user satisfaction with the decision aid. A valid scale in which effort and difficulty are perceived to be reduced, while increasing accuracy, should also receive high satisfaction ratings. Table 3 displays each dimension's relationship with overall decision aid satisfaction. Those who were very satisfied with the aid (scores less than 4 on a 9 point satisfaction scale) also perceived that the aid offered them less difficult, more accurate, and less effortful decision making, relative to those who were less satisfied (scores of 4 or greater). These results are what would be expected for measures of effort, difficulty and accuracy to demonstrate nomological validity.

Reliability

Following the scale development paradigm of Gerbing and Anderson (1988), reliability was assessed after discriminant validity was established. The reliability of the scales, assessed using Cronbach's alpha, was .898 for Effort, .846 for Difficulty, and .890 for Accuracy. In addition, the individual Alpha's for each decision aid were high for every dimension as the lowest was .823 (Table 4). These reliabilities are considered to be quite adequate (Nunnally 1978).

Conclusion

In this study, a set of scales measuring three key aspects of decision making have been tested. The scales, measuring effort, difficulty, and accuracy, have been shown to be unidimensional, possess nomological validity, and are reliable. These scales, which measure user evaluations of decision aids, should prove useful to both decision aid researchers and information providers. The promise of decision aids is that they might increase decision quality, while simultaneously making the task less difficult and effortful. By using a valid and reliable scale which measures the accuracy, difficulty and effort dimensions, researchers and information providers will be able to determine the degree to which decision aids/formats perform from the users perspective. In doing so, aids can be developed and marketed which will provide a

satisfying experience to the user, thereby increasing the likelihood they will used in purchase decisions.

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Table 1
Measurement Scale Items

NOTE: Please answer all questions, in this section, about the "Computer Format" you used in comparison to a format presenting the same information, but with the brands listed in random order on a sheet of paper (e.g., on a magazine page). Remember to read the question scale endpoints carefully and that they apply towards the computer format.

Please circle the number which best expresses your feeling on the following questions.

1. How do you feel the use of the computer format affected any **frustration** you may have experienced in decision making, in comparison to a format presenting the same information, but with brands listed in random order on a sheet of paper.

Greatly Decreased Decision Frustration	<---:---:---:---:---:---:---:---:---:--->	Greatly Increased Decision Frustration
	1 2 3 4 5 6 7 8 9	

2. How do you feel the use of the computer format affected the **time** you spent making your decision, in comparison to a format presenting the same information, but with brands listed in random order on a sheet of paper?

Greatly Decreased Decision Time	<---:---:---:---:---:---:---:---:---:--->	Greatly Increased Decision Time
	1 2 3 4 5 6 7 8 9	

3. How do you feel the use of the computer format affected the **accuracy** with which you made your best choice decision, in comparison to a format presenting the same information but with brands listed in random order on a sheet of paper?

Greatly Increased Decision Accuracy	<---:---:---:---:---:---:---:---:---:--->	Greatly Decreased Decision Accuracy
	1 2 3 4 5 6 7 8 9	

4. How do you feel the use of the computer format affected any **difficulty** you may have experienced in decision making, in comparison to a format presenting the same information, but with brands listed in random order on a sheet of paper?

Greatly Decreased Decision Difficulty	<---:---:---:---:---:---:---:---:---:--->	Greatly Increased Decision Difficulty
	1 2 3 4 5 6 7 8 9	

5. How do you feel the use of the computer format affected the amount of **thinking** required to make your best choice, in comparison to a format presenting the same information, but with the brands listed in random order on a sheet of paper?

Greatly Decreased Thinking Required	<---:---:---:---:---:---:---:---:---:--->	Greatly Increased Thinking Required
	1 2 3 4 5 6 7 8 9	

When completed with this page, please turn the page.

Table 1 Continued:

6. How did the use of the computer format affect the amount of **thought** you put into making your best choice, in comparison to a format presenting the same information but with the brands listed in random order on a sheet of paper?

Greatly Decreased Thought Required	<---:---:---:---:---:---:---:---:---:--->	Greatly Increased Thought Required
	1 2 3 4 5 6 7 8 9	

7. How did the use of the computer format affect the amount of **confidence** you had that you made the best choice for you, in comparison to a format presenting the same information but with brands listed in random order on a sheet of paper?

Greatly Increased Decision Confidence	<---:---:---:---:---:---:---:---:--->	Greatly Decreased Decision Confidence
	1 2 3 4 5 6 7 8 9	

8. How did the use of the computer format affect any **confusion** you may have experienced in decision making, in comparison to a format presenting the same information, but with brands listed in random order on a sheet of paper?

Greatly Decreased Decision Confusion	<---:---:---:---:---:---:---:---:--->	Greatly Increased Decision Confusion
	1 2 3 4 5 6 7 8 9	

9. How do you feel the use of the computer format affected the degree of **certainty** you have that you made the best choice for you, in comparison to a format presenting the same information in random order on a sheet of paper?

Greatly Increased Decision Certainty	<---:---:---:---:---:---:---:---:--->	Greatly Decreased Decision Certainty
	1 2 3 4 5 6 7 8 9	

10. How do you feel the use of the computer format affected the amount of **mental effort** you expended in making your best choice, in comparison to a format presenting the same information in random order on a sheet of paper?

Greatly Decreased Mental Effort	<---:---:---:---:---:---:---:---:--->	Greatly Increased Mental Effort
	1 2 3 4 5 6 7 8 9	

11. Overall, how **satisfied** are you with the computer format, compared to a format presenting the same information, but with brands listed in random order on a sheet of paper?

Greatly Increased Decision Satisfaction	<---:---:---:---:---:---:---:---:--->	Greatly Decreased Decision Satisfaction
	1 2 3 4 5 6 7 8 9	

Table 2
Common and Confirmatory Factor Analysis Results

Common Factor Analysis Pattern Matrix
(Maximum Likelihood, Oblique Rotation)

	FACTOR LOADINGS		
	FACTOR 1 Accuracy	FACTOR 2 Effort	FACTOR 3 Difficulty
V1: frustration experienced	-.206	.103	.713
V2: accuracy of your choice	.656	-.003	.253
V3: difficulty experienced	.077	.030	.753
V4: thinking required	.052	.876	-.040
V5: thought you put into	-.031	.901	-.021
V6: confidence you had	.829	-.011	.008
V7: confusion you experienced	.008	-.063	.873
V8: certainty of your decision	.949	.025	-.072
V9: mental effort you expended	-.015	.793	.101
FACTOR EIGEN VALUE:	4.65	1.96	.696
VARIANCE %:	51.6%	21.7%	7.7%

CONFIRMATORY FACTOR ANALYSIS
(Correlation Matrix, Maximum Likelihood)

V1: frustration experienced		.757
V2: accuracy of your choice	.831	
V3: difficulty experienced		.831
V4: thinking required		.864
V5: thought you put into		.873
V6: confidence you had	.829	
V7: confusion you experienced		.829
V8: certainty of your decision	.875	
V9: mental effort you expended		.854

Chi-square = 37.95, 24 df, p=.035

Bentler-Bonett Normed Fit Index = .970

Bentler-Bonett Nonnormed Fit Index = .983

Average Absolute Standardized Residuals = .024

Average Off-Diagonal Absolute Standardized Residuals = .031

Largest Standardized Residual = .089

t-values for all factor loadings > 12, p < .001

Table 3

Nomological Validity

MEAN VALUES

	DIFFICULTY ₁	EFFORT ₁	ACCURACY ₁ pre comparison	ACCURACY ₁ post comparison
EVALUATED ₂ :				
LT 11 (n=168)	3.23	3.31		
GT 10 (n=46)	3.78	3.83		
t value	(-1.89)**	(-2.20)**		
PERCEIVED TIME:				
LT 4 (n=167)		3.06		
GT 3 (n=44)		4.77		
t value		(-8.62)**		
MATCH ₃ :				
EQ NO (n=96)			3.52	3.88
EQ YES (n=118)			3.56	3.57
t value			(-.24)	(1.50)*

	MORE SATISFIED USER (score < 4, n=160)	LESS SATISFIED USER (score > 3, n=54)	t Value
DIFFICULTY ₁ :	2.76	4.22	8.69**
EFFORT ₁ :	3.27	3.71	2.19**
ACCURACY ₁ :	2.95	5.05	13.14**

* = p < .1

** = p < .05

1: dimension means presented in table are the average of the three measures of each dimension. Each dimension was measured with a nine-point schale, with 1=Greatly Decreased Decision Difficulty, Effort and Accuracy.

2: self report measure of number of brands "thoroughly evaluated"

3: Match is the measure of decision quality. Yes = did not switch during comparison session. No = did switch during comparison session.

Table 4
Reliability

	CRONBACH ALPHA			
	OVERALL (n=212)	CUTOFF (n=76)	EQUAL WEIGHT (n=68)	LINEAR (n=68)
EFFORT	.898	.937	.847	.884
DIFFICULTY	.846	.823	.856	.844
ACCURACY	.890	.874	.893	.900