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Fui Hooh (Fiona)Nah
Purdue University, fnah@mgmt.purdue.edu

Izak Benbasat
University of British Columbia, izak@unixg.ubc.ca

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Recommended Citation
(Fiona)Nah, Fui Hooh and Benbasat, Izak, "Using Expert Support and its Explanation Facilitiesfor Group Decision Making" (1997). *AMCIS 1997 Proceedings*. 328.
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Using Expert Support and its Explanation Facilities for Group Decision Making

Fui Hoon (Fiona) Nah
Krannert Graduate School of Management
Purdue University
1310 Krannert Building
West Lafayette, IN 47907-1310
Email: fnah@mgmt.purdue.edu
Izak Benbasat
Faculty of Commerce and Business Administration
University of British Columbia
2053 Main Mall
Vancouver BC Canada V6T 1Z2
Email: izak@unixg.ubc.ca

Introduction

As information technology is increasingly used to support group work, it becomes desirable to identify the types of computer-based decision aids that are *beneficial* for supporting group decision making. In a review of the decision support literature, Benbasat, DeSanctis and Nault (1993) point out the lack of empirical research in examining the use of expert support for group decision making. In our review of the literature in this respect, we identified only *one* case study (Sviokla, 1989), which examined the processes involved in the pre- and post-use of an expert support system (ESS) called PlanPower by a group of financial planners at The Financial Collaborative (TFC). This lack of empirical research in examining the potential use of ESS as a group support tool prompted us to investigate the usefulness of ESS in supporting group decision making. In this research, we will evaluate the effect of expert support and its explanation facilities on group decision accuracy.

Theoretical Foundation

The features of the expert support technology can be viewed in terms of the lens model framework (Dhaliwal and Benbasat, 1996; Nah and Benbasat, 1995), which is based on Brunswik's (1952) theory of perception or the so-called cue theory. According to the theory, an individual does not have direct access to information about the objects in the environment. Instead, perception is an indirect process, mediated by a set of proximal cues. In accordance with this view, judgment is viewed as a process which involves the integration of information from a set of cues (as presented by the cognitive system in Figure 1).

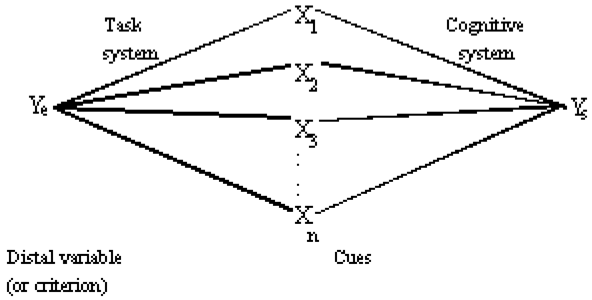


Figure 1: Brunswik's Standard Lens Model

The lens model, as illustrated in Figure 1, defines the unit for psychological analysis as a system consisting of two subsystems. These subsystems have a common interface which consists of the proximal cues in perception. The two subsystems in the model are the *task system* and the *cognitive (or judgmental) system*. The task system is defined in terms of the relations between the cues (Xi) and the distal variable (Ye) of interest to the person, as well as the relations among the cues (Xi). The cognitive system is defined in terms of the relations between the cues (Xi) and the judgment (Ys).

The literature on "multiple-cue probability learning", which refers to learning to make valid inferences from several cues that are only probabilistically related to a criterion, has shown that cognitive feedback (CFB) is more effective than outcome feedback (OFB) in improving the accuracy of judgments (Todd and Hammond, 1965). OFB, or the knowledge of results, does not appear to be appropriate for learning probabilistic relations because it yields information which is restricted to a comparison of end results -- the comparison of the response with the correct answer. The CFB paradigm, on the other hand, refers to information about relations rather than outcomes. A review of the CFB literature by Balzer et al. (1989) indicates that *task* information (i.e., information about the relations in the task environment), rather than *cognitive* information (i.e., relations perceived by the decision maker), is the aspect of CFB that influences performance. Specifically, task information refers to relations between the cues and the criterion, and information about the criterion or the cues themselves, or both, whereas cognitive information largely mirrors task information and refers to information about the cognitive system.

The support provided by the ESS corresponds to information about the task environment (Dhaliwal and Benbasat, 1996; Nah and Benbasat, 1995). As mentioned earlier, the expert support technology is capable of providing two fundamental types of task support -- the ability to give advice and draw conclusions, and the ability to explain its reasoning and conclusions. Put into the framework of the lens model, the two types of expert support complement each other in providing a more complete set of information about the task environment. When no decision support is available, the decision makers will have to make their group judgment solely from *cues* available in the environment (Xi). It is assumed that the group judgment is derived from some combination of the individual judgments. In the case where ESS analyses are provided without explanations support, the ESS provides only advice about the criterion (Ye). When the decision maker is supported by both ESS analyses and explanations support, in addition to advice about the criterion, explanations about how the criterion (Ye) is related to the cues (Xi), as well as how the cues are related to one another, are also provided.

Hypothesis

Consistent with the multiple-cue probability learning literature which suggests that it is the task information component of CFB that is responsible for improvement in performance, we hypothesize that

H: The greater the level of expert support provided to groups, the greater the accuracy of group decision made.

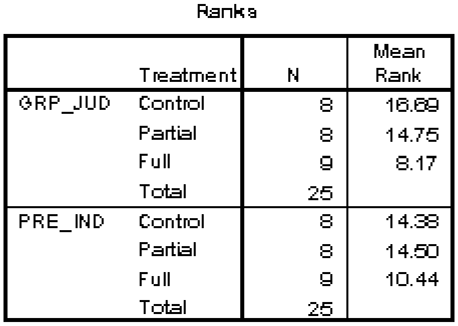
Research Methodology and Task

An experimental design was employed to test the above hypothesis. A commercial loan decision task was used which involved an evaluation of the financial position, performance, and potential of a company and the determination of an appropriate loan amount. A total of 75 subjects participated in the study. The subjects were final year undergraduate Commerce students majoring in Accounting, and undergraduate and graduate students who were taking a Financial Statements Analysis course. The subjects were randomly assigned to groups of three. They first performed the task individually and without any form of ESS support. They were then asked to make the same set of decisions as a group. Eight of these groups made the decision without any form of ESS support; eight groups were provided with the ESS without the explanation support; and nine groups were provided with the complete ESS support, which includes the explanation support. Subjects worked in their groups until a consensus is reached.

The ESS was developed based on the knowledge of five experts in financial analysis and validated in a number of pilots (see Dhaliwal, 1993). It provides five aspects of financial analysis -- liquidity analysis, capital structure analysis, profitability analysis, market value analysis, and funds flow analysis -- as well as an overall analysis. Decision accuracy is assessed with respect to the judgments derived by a consensus of these five experts ("expert judgments").

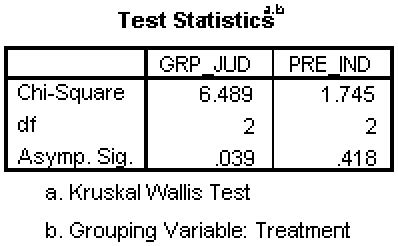
Results

Decision accuracy was determined by the amount of deviation (in absolute terms) of the group judgments from the expert judgments. The lower the deviation, the higher the decision accuracy. The results were analyzed using the Kruskal Wallis Test with decision making groups as the level of analysis.



Ranks

	Treatment	N	Mean Rank
GRP_JUD	Control	8	16.69
	Partial	8	14.75
	Full	9	8.17
	Total	25	
PRE_IND	Control	8	14.38
	Partial	8	14.50
	Full	9	10.44
	Total	25	



Test Statistics[a,b]

	GRP_JUD	PRE_IND
Chi-Square	6.489	1.745
df	2	2
Asymp. Sig.	.039	.418

a. Kruskal Wallis Test

b. Grouping Variable: Treatment

Note:

Grp_jug - deviation of group judgments from expert judgments

Pre_ind - average deviation of group members' initial individual judgments from expert judgments

Control - control group (no ESS support)

Partial - ESS without explanations support

Full - ESS with explanations support

The *initial* judgments (pre_ind) were checked to ensure that there was no significant difference in decision accuracy across the treatment groups (p<.418). However, a significant difference in the deviation of group judgments from expert judgments (grp_jud) exists across the treatments (p=.039<.05). The results, therefore, support the hypothesis that group decision accuracy is increased with increasing level of ESS support. Further analysis using the Mann-Whitney 1-tailed U test indicates that the groups that were provided with the ESS and its explanations support made more accurate judgments than groups in the control condition (i.e., no ESS support) (p=.0105) and groups that were provided with the ESS without the explanations support (p=.0295). There was no significant difference in decision accuracy between groups in the control condition and those that were provided with the ESS without the explanation support (p=.287). This seems to indicate that explanation support, rather than analysis support, is responsible for the observed improvement in group decision accuracy.

Conclusion

This research is one of the first few to examine the impact of ESS on group decision making. The results indicate that ESS support can be used to improve the accuracy of group decisions. Explanations support seems to be responsible for greater improvement in group decisions than analyses support. This signifies the importance of incorporating explanation features into ESS when one is used as a group decision support tool. To conclude, the results of this empirical research seem to indicate that explanation facilities are a necessary component of the ESS in order for knowledge transfer to take place from the ESS to the decision makers.

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