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Does Positive Affect Influence the Effective Usage of a Decision Support System?

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ABSTRACT

This study examines the impact of positive mood on the effective usage of a Decision Support System (DSS). Using current cognitive theories, a theoretical argument about DSS usage is developed. This argument is then investigated via a lab experiment. The results of the lab experiment show that decision makers in positive mood used a greater number of informational cues provided by the DSS and made more accurate judgments.

Keywords: Decision Support Systems, DSS, Affect, Mood, Decision Making, Decision Behavior, Judgments, Accuracy, Effort, Information Utilization, DSS usage

1. Introduction

Many of the current models of decision making assume rational actors that are not influenced by their feeling states when making judgments [4,9,13,27]. The empirical investigations of the past three decades in psychology, however, have shown that every day feeling states can influence the thoughts that come to mind and thereby influence a decision that relies on those thoughts [20,32,33,40]. In particular, current cognitive theories and a growing body of evidence supporting them suggest that mild states of

positive mood can significantly enhance cognition and behavior [2,16,21-23,40]. Even small positive events, such as receiving a small gift, can bring about significant changes in an individual's thought processes and behavior. The positive mood theory proposed by Isen [33,40] is one of the prominent theories developed to explain the enhancing effects of positive mood on cognition and behavior. Although a large number of investigations used the positive mood theory to explore the effects of positive mood in the areas of social behavior and cognition [2,10,16,40,43,64], little work has been done to incorporate this theory in the DSS literature.

This study contributes to the DSS literature by investigating the effect of positive mood on the effort (amount of information used) and the accuracy (quality of the judgments made) when using a DSS. Effort and accuracy are often used in the DSS literature to investigate decision behavior and the effective usage of a DSS [69]. The positive mood literature suggests that positive mood effects could be a factor that influences how effectively a DSS is used. Based on the positive mood theory [33,40], this study develops a theoretical argument predicting that positive mood can improve both effort and accuracy measures of decisions and thus improve the effective usage of a DSS. Then, through a lab experiment these predictions are tested.

The results of this study have both theoretical and practical significance. As mentioned previously, the affective states of users are largely ignored in current decision models in the DSS literature. The results of this study show that positive affect has an impact on DSS usage. Thus, this study provides evidence that including users' feeling states in behavioral decision models could be a productive avenue for further research and theory development in DSS research. From a practical viewpoint, the results of this study, combined with known methods for fostering positive mood, provide organizations with possible avenues for increasing returns on their IT investments through improving the effectiveness of IT usage.

2. Literature Review

This section provides a review of theories used in this study. The section starts with a short review of the literature on decision behavior. It continues with a review of the current and relevant literature on positive affect.

2.1. Decision Behavior

It is commonly believed that one way to improve decision performance is to use all the available relevant information provided. Many decision making studies in the judgment literature, however, suggest that human judges tend to use only a subset of the cues or information available to them [8,63]. The DSS literature also suggests the same pattern of behavior even when decision makers are provided with computerized decision aids [4,69].

One way to explain why decision makers use only a subset of information is by arguing that they have a limited cognitive capacity [47]. Rooted in the notion of “bounded rationality” [62] and implicit in the traditional DSS literature, this explanation suggests that decision makers would be willing to perform a more complete analysis but cannot. Since computerized decision aids can replace or automate certain cognitive processes, these tools can increase the effort expenditure and information processing of decision makers. Thus according to this view, computerized decision aids augment decision makers’ cognitive capability and therefore enable them to make more accurate judgments [66].

Another way to explain why all the available information is not used by decision makers is to look at the problem from the cognitive cost point of view. According to this perspective, decision makers tend to place a higher value on reducing their effort than on maximizing their decision quality [67,69]. Looking at it this way, DSS usage leads to more efficient decision making with no impact on decision quality. The cognitive cost point of view is rooted in the cost-benefit framework of cognition proposed by Payne [56]. This framework suggests that decision makers have two main objectives: increasing

decision accuracy and reducing effort. Since accuracy maximization and effort minimization often conflict, decision makers tend to make trade-offs between these two objectives [56].

Despite the differences between the traditional DSS and the cognitive cost points of views, both models assume decision makers are rational actors who are not influenced by their feeling states at the time they make judgments. The psychological investigations of the past three decades, however, suggest that mundane everyday positive feeling states play a great role in cognition and behavior [2,21,32,40]. Laboratory experiments have shown that ones' positive feeling states can significantly influence one's cognitive context, structure, and flexibility as well as one's information processing style [16,21,22,31,32,39,40,43,54]. In short, positive feeling states can influence how our thoughts are formed and accessed and thereby influence decisions that relies on those thoughts [21,40]. The following section provides a brief review of the literature on positive affect and its impact on cognition.

2.2. Positive Affect

In this study the impact of positive mood on the effective usage of a DSS is examined. Mood can be examined both as a state or a trait variable [25,26]. Similar to prior research in IS [45,71], mood in this study is examined as a state variable. Moreover, this study examines subjects' moods and not their emotions. Although moods and emotions are both affective states, they differ on three dimensions: "pervasiveness", "intensity", and "specificity" [19,21,50,53]. Emotions are short-lived strong reactions that have both a specific cause (such as emotions resulting from a provocative act) and a target (such as being angry at someone or about something). Moods, on the other hand, usually refer to less intense and more enduring affective states. These defused affective states (moods) are not directed toward any particular object or behavior. Finally, particular mood states (such as sadness, fear, happiness, joy, etc.) can be grouped into the more general or global categories of positive, neutral, and negative mood [12,55,60].

This study focuses on the impact of positive mood states on DSS usage. This is done because the positive mood literature provides compelling evidence suggesting that positive mood theory may be particularly applicable in DSS usage. Moreover, focusing on one mood category is important since the theoretical foundations for the effects of positive and negative mood categories are not the same [21,30].

Recent psychological research suggests that affective states and memory are intimately linked [20,32,42]. For example, a number of theories have argued that cognition and affective states are both part of a single integrated cognitive representational system [7,12]. According to these models, each event, concept, and affective state is represented by a node in a large network of material in memory and is connected through associative relations to other nodes.

According to the positive mood theory, when people are in a positive mood the network of material in their cognitive system is diverse, rich and flexible [33,40]. Consistent with this theory, a large number of studies have shown that positive mood can significantly enhance one's cognitive ability and behavior [2,16,22,23,43]. Compared to their control counterparts, people in positive mood are able to perceive a greater number of similarities among stimuli when they are asked to find similarities [36] and can find a greater number of differences when they are asked to do so [54]. They tend to be thorough and efficient decision makers who exhibit significantly less confusion, greater integration of information, and better understanding of the issues at hand [16,43]. Positive mood facilitates perception of new and unusual but useful associations [39] and promotes creative problem solving [37]. When in a positive mood people tend to be more willing to try new things and tend to enjoy exploring their options [46]. These enhancing effects are also supported by a recent neuropsychological study [1]. According to this study, the enhancing effects of positive mood on cognition and behavior may be due to the release of dopamine into the anterior cingulate region of the brain [1].

In short, the literature discussed above suggests that people in positive mood have a rich and flexibly organized cognitive context [33,39,40,54], which enables them to be creative and efficient problem solvers [16,37,43] who enjoy exploring their options and seek variety [46].

In the following sections, using the studies described in the above literature review, two hypotheses are formed. Then, a description of how the laboratory experiment was conducted is given. Finally, the results of the experiment are reported and discussed.

3. HYPOTHESIS

Effort and accuracy are two measures of a decision that have been the focus of many studies in the DSS literature [6,61,69]. Consistent with this line of research, this study also uses effort and accuracy to investigate the role of positive mood in judgmental performance when using a DSS. Effort is measured by tracking the amount of information used to make a judgment. Accuracy of a judgment is measured by examining its deviation from the normative strategy. A detailed description of how effort and accuracy were measured in this study is provided in the Method section of this paper.

3.1. Hypothesis One

Hypothesis One asserts that subjects in positive mood will base their decisions upon a greater number of cues provided by the DSS. From the positive mood literature, one can argue that there are at least three good reasons why subjects with positive mood, compared to their control counterparts, would exhibit a greater degree of effort. First, positive mood tends to promote variety seeking and exploration [46]. Thus, it is reasonable to believe that the subjects in positive mood will be more inclined to examine a greater number of cues. Second, people in positive mood tend to be efficient and flexible decision makers who can integrate new information more effectively [16] and are less overwhelmed or confused by the task [43]. Because of their enhanced information processing capability, it is reasonable to expect subjects in positive mood to gather more information (i.e., cues) upon which to base their judgments. Third, positive mood tends to facilitate elaboration [43]. Thus, it is reasonable to expect the subjects in positive mood to be more thorough and use a greater number of cues when making a judgment.

Therefore, this study expects to reject the null hypothesis in favor of this alternative for the subjects in the positive mood group:

H1) Subjects in positive mood will exhibit a greater degree of effort than their control counterparts. That is, compared to their neutral mood control counterparts, subjects in positive mood will use a greater number of cues provided by the DSS to make a decision.

3.2. Hypothesis Two

Compared to their control counterpart, people in positive mood tend to be less overwhelmed or confused by the task and tend to show a greater understanding of the issues at hand. They also tend to be creative problem solvers who show flexibility and efficiency when integrating information [16,32,37,39,40,43,54]. Such enhanced cognitive capability is of great importance when it comes to making good decisions. Therefore, it is reasonable to believe that people in positive mood will be able to combine the provided information into more accurate judgments. Thus, this study expects to reject the null hypothesis in favor of this alternative for the subjects in the positive mood group:

H2) Subjects in positive mood will make more accurate judgments than their control counterparts. That is, the mean absolute error of the judgments for the subjects in the positive mood group will be significantly lower than those of the neutral mood group.

4. METHOD

This section provides an overview of the laboratory experiment. The section starts with a brief description of the participants in this study. It continues with an explanation of the design of the study

followed by a discussion of the mood treatment, the task, and the measurements used. Finally, the section provides an explanation of how the laboratory experiment was conducted.

4.1. Participants

The participants were undergraduate business students from two sections of a third year statistics course of a major land grant university. All forty-nine male and female students enrolled in these two sections participated in the experiment and received class credit for their participation.

4.2. Design

First, participants were randomly assigned to two groups. Then, the treatments (experimental and control) were randomly assigned to these two groups. The subjects in the experimental group were induced with positive mood by receiving a small gift of chocolate. The mood of the subjects in the control group was not manipulated.

4.3. Mood Treatment

Consistent with prior research [16,37,41,42,44], subjects in the experimental treatment group (positive mood group) received a surprise gift of chocolate and candy wrapped in colorful paper a few minutes prior to performing the task. Once again, consistent with prior research [16,37,42,44], the mood manipulation was disguised by presenting the surprise gift as a small token of appreciation. The participants in the control group did not receive a surprise gift.

4.4. Task

The task used in this experiment was a Multiple Cue Probability Learning (MCPL) task. Since the MCPL paradigm provides a general laboratory method of analysis for judgments, this paradigm is often used to study judgments in a laboratory setting [9]. Judgment can be defined as a cognitive process

in which a person draws a conclusion (a judgment) about something he or she cannot see (a criterion) on the basis of a set of data (cues and/or feedback) he or she can see [9,27]. In other words, when making a judgment, one has to use the information provided by the cues and combine it into a single decision.

The task used in this experiment was based on Holt, Modigliani, Muth, and Simon's [29] model of the production-scheduling problem. The problem in this task was to decide how many units to produce given an uncertain future demand and the knowledge of the current work force size, productivity, and inventory levels. The production-scheduling problem was selected because it is a cognitively complex and managerially relevant problem. Furthermore, this task has been calibrated with actual data [28].

The equation modeling in the production-scheduling decision is as follows:

$$\begin{aligned} \text{Production Decision} = & b_0 + b_1 * (\text{work force last month}) - b_2 * (\text{inventory on hand}) + b_3 * \\ & (\text{the current month's demand}) + b_4 * (\text{the demand for next month}) + b_5 * (\text{the demand for two} \\ & \text{months ahead}). \end{aligned} \quad (1)$$

The decision rule described in Equation 1 describes a perfect world with no uncertainties. To mimic the real world in an experimental setting, an error term through which the predictability or difficulty of the task is manipulated is generally added to the above equation:

$$\begin{aligned} \text{Production Decision} = & b_0 + b_1 * (\text{work force last month}) - b_2 * (\text{inventory on hand}) + b_3 * \\ & (\text{the current month's demand}) + b_4 * (\text{the demand for next month}) + b_5 * (\text{the demand for two} \\ & \text{months ahead}) + e \end{aligned} \quad (2)$$

The coefficients used in the above equation were estimated by Holt, Modigliani, and Muth [28] for the production-scheduling decision at Pittsburgh Plate Glass. The coefficients values were $b_0=148.5$, $b_1=1.005$, $b_2=0.464$, $b_3=0.464$, $b_4=0.239$, and $b_5=0.113$. The error term (e) added to this task was normally distributed with a mean of zero and a standard deviation of 100. Task predictability or

difficulty, measured through the correlation between the values of the production decision in Equation 1 and production decision in Equation 2, was moderate ($R_c = 0.75$).

There were 30 trials in this experiment. In each trial, the subjects were provided with five cues: the current month's demand, the demand for next month, the demand for two months ahead, current work force size, and inventory on hand. The participants used these five cues to set the current production level. All cues were randomly generated and normally distributed with the following mean and standard deviations: current month (Mean = 2500, SD = 200), next month (Mean = 2500, SD = 200), two months ahead (Mean = 2500, SD = 400), work force (Mean = 440.92, SD = 17.64), and inventory on hand (Mean = 300, SD = 100).

The task was presented to the subjects via desktop computers. The subjects made their judgments by adjusting a slider or using a scrollbar to set their desired value. A small window on the bottom right corner of the screen displayed a message to motivate subjects to do their best. A judgment was submitted by clicking on a button labeled "I am satisfied with my current decision." Once this button was pushed the subject's judgment, the optimal judgment, and the percentage error of the subject's judgment (outcome feedback) was displayed in a dedicated section of the screen. A short history of the subject's five most recent judgments along with the optimal judgment (the value of the production decision calculated through Equation 2) and the percentage error were also displayed. At the same time, the window that displayed the motivational message was replaced by another window displaying the optimal value in a large font and a button labeled as "OK to Continue". This button was used to start a new trial (i.e., a new set of randomly determined and statistically independent cue values). Once subjects submitted a judgment (after they started a new trial and/or after clicking the button "I am satisfied with my decision") they were unable to go back. That is, the task was designed in a way to prevent subjects from accessing previous screens or changing their previous judgments.

4.5. Effort and Accuracy Measurements

Effort was measured by tracking the number of cues used to make a judgment. Consistent with prior research [11,70], cue utilization was obtained by counting the number of statistically significant ($\alpha = 0.05$) beta weights in the subject's captured policy. The task in this study consisted of 30 trials (i.e., 30 judgments). The first 10 trials (trials 1-10) were considered as a learning period and thus were excluded from the data analysis. Beta weights for each subject were calculated by regressing the subject's decisions in trials 11 through 30 against the five provided cues in the task. The results of this regression provided a set of coefficients (beta weights) and their corresponding p values for the cues. Consistent with prior research [11,70], if the p value for a cue was less than 0.05 (i.e., statistically significant) it was assumed that the cue was used by the subject. The number of cues utilized by each subject was then compared for the two treatment groups.

Accuracy is typically operationalized as the deviation of a solution from the solution provided by a normative strategy [69]. Similarly, in this study accuracy was measured by calculating the deviation of a subject's judgments from solutions provided by the normative strategy described in Equation 2. As explained in the above paragraph only the last 20 trials (trials 11 to 30) of the judgment task were included in the data analysis. For each subject, the mean of absolute differences between subject's production decisions and the optimal production decisions in trials 11 to 30 were calculated. These means of absolute differences or errors were then used to compare the accuracy of decisions between the experimental and control groups.

4.6. Mood Measurement

Consistent with prior research [15,38,49], a self-report survey was used to measure the affective state of the subjects. The subjects were asked to rate on a five-point scale, (with 1 denoting "strongly disagree", 3 denoting "neutral", and 5 "strongly agree") how each of the words "pleased", "happy", and "glad" described their current mood. The same words ("pleased", "happy", and "glad") were used on the

mood manipulation survey by Elsbach and Barr [15]. To measure positive mood, Elsbach and Barr [15] employed words that described affective states moderate in the dimension of arousal but high in the dimension of pleasantness. Elsbach and Barr [15] further showed that the items on their survey were strongly related. They used these items, which measured specific mood states (glad, happy, etc.), to measure the global positive mood by grouping these items into one category and calculating their composite score.

In this study, to verify the internal reliability [48] of the items “happy”, “pleased”, and “glad”, as reported by Elsbach and Barr [15], the reliability coefficient (r_{tt}) described in Kerlinger [48] was used. This test of reliability verified the findings of Elsbach and Barr [15] and showed a strong relationship among the items “happy”, “pleased”, and “glad” ($r_{tt}=0.882$).

Consistent with prior research [15,49], for each subject a composite mood score was calculated. In other words, the ratings for the items “happy”, “pleased”, and “glad” on the survey, were added to calculate a single composite mood score for each subject. The mean of these composite mood scores were then compared for the two treatment groups.

4.7. Procedure

This experiment was conducted over two days (Tuesday and Thursday) of the same week. The same person gave the instructions to both groups. To ensure consistency, the instructions were read from a written script. The possibility of mood contamination (i.e., the subjects on Thursday learned about the surprise gift given on Tuesday) was eliminated by conducting the control part of the experiment first. All subjects were instructed not to talk about the experiment to anyone until the following week after the experiment was completed.

On the day of the experiment, the participants gathered in their classroom. Upon arrival, the subjects received a card with a randomly assigned seat number typed on it. The random seat numbers were used to eliminate situations that might have possibly affected the subjects’ mood (e.g., sitting near a

friend or in a favorite spot). Subjects were informed that this experiment investigated managerial decision making. They were told that the software package that they were about to use was designed to assist managers in making decisions. To motivate subjects to do their best, they were told that by doing their best to make a decision, whether accurate or not, they would provide invaluable input for the investigations at hand, and they would help to improve the software package.

The subjects were given a short tutorial of the task. During this tutorial, they were told that they would encounter a survey, which is part of a standard method of evaluating software packages and is routinely used. It is customary in mood studies to disguise the nature of the experimental manipulation. Thus, consistent with prior research [37,49,52], the subjects were told that the mood survey that they would encounter would be used to measure something other than their mood. After the tutorial, the mood of the subjects in the experimental group was manipulated. That is, after the tutorial the subjects in the experimental group received a surprise gift of candy and chocolate. The subjects in the control group did not receive a gift (no manipulation). The subjects were then asked to go to their designated computers in the computer lab.

In the computer lab, the subjects activated the software package that included two practice trials, the mood survey, and the actual task that consisted of 30 trials. The software was designed in a way that participants had to complete the mood manipulation survey followed by practice trials before they could start the actual task. After finishing the task, the subjects were debriefed and asked to leave the room. The entire procedure did not exceed one hour.

5. RESULTS

In the following sections the results of the mood manipulation check as well as the results of Hypothesis One and Two are reported.

5.1. Mood Manipulation Check

Consistent with prior research [15,49], a composite mood score of the items (“happy”, “pleased”, and “glad”) on the survey for each subject was calculated. That is, the ratings for each of the three items on the survey were added to calculate a single composite mood score for each subject. The mean of these composite mood scores were then compared for the two treatment groups. As expected and confirmed by the one tailed t-test, the mean of the composite mood scores for the positive mood group (mean = 11.24) was significantly higher ($t = 1.959$, $df = 47$, $p = 0.028$) than the mean of the composite mood scores for the neutral mood group (mean = 10.00). In other words, these results attest that positive mood was successfully induced.

Literature suggests that the effects of positive mood induced with a small surprise gift lasts for approximately 20 minutes [35]. Although in this study no specific time limit for completing the task was given, all the subjects finished the experiment before the expected time (the entire procedure including instructions, mood manipulation and task did not exceed one hour). On average, the subjects finished the task in less than 20 minutes with a task duration mean of 18.25 minutes for the positive mood group and 16.83 minutes for the neutral mood group.

5.2. Hypothesis Testing

The task in this study consisted of 30 trials (30 judgments). All the results discussed below are based on the actual trials (trials 11-30). The learning period data (trials 1-10) was not included. Regression analysis was used to capture the subject’s judgmental policy.

5.2.1. Hypothesis One

Hypothesis one proposes that the subjects in the positive mood group will use a greater number of cues provided by the DSS. Consistent with prior research [11,70], cue utilization was obtained by counting the number of statistically significant ($\alpha = 0.05$) beta weights in the subject’s captured

policy. The results of the one-tail t-test showed that the mean of the number of cues used in the positive mood group (mean = 2.52) was significantly higher ($p = 0.03$, $t = 1.84$) than the mean of the number of cues used in the neutral mood group (mean = 1.92). In other words, the results showed as hypothesized the subjects in the positive mood group used a greater number of cues.

5.2.2. Hypothesis Two

Hypothesis two proposes that the subjects in the positive mood group will make more accurate judgments. Consistent with Todd and Benbasat's [69] definition of decision accuracy (i.e., the deviation of a particular solution from the solution provided by a normative strategy), the accuracy of a judgment was measured through examining its deviation from the normative strategy described by Equation 2.

The one tail t-test revealed that the mean of the absolute error in the positive mood group (MAE = 112.23) was significantly lower ($t = 2.246$, $df = 40$, $p = 0.015$) than the mean of the absolute error in the neutral mood group (MAE = 127.16). In other words, the results showed that people in positive mood, compared to their neutral mood control counterparts, made significantly more accurate decisions.

6. DISCUSSION

In this study the influence of positive mood on information utilization and accuracy of judgments using a DSS was examined. The analysis of composite mood scores between the experimental and control groups showed that positive mood was successfully induced in this experiment. Furthermore, the results showed that people in the positive mood group exhibited a greater level of effort (measured as the number of cues used) as well as a greater degree of accuracy (measured as the deviation of judgments from the normative strategy) when making judgments using a DSS. In other words, the results showed that subjects in the positive mood treatment, compared to subjects in the neutral mood treatment, utilized their DSS significantly more effectively. These results support the hypotheses of this study and are consistent with the positive mood theory discussed in the literature review section of the paper.

From the perspective of DSS research, the results of this study provide evidence for a potentially productive avenue to further research and theory development. The results show that the predictions of positive mood theory apply to DSS usage. Thus, these results help to establish mood as an important variable in existing decision making theories in the DSS literature. The results also show a significant improvement in two important measures: effort (information utilization) and accuracy (quality) of the judgments. Both of these measures have been the primary focus of many studies in the DSS literature. The significant improvement in effort is particularly important since a number of studies show that decision makers use only a small number of cues available to them [4,8,51,63,69].

The results of this study have important implications for measurements in DSS theories investigating decision behavior. Since the results show that positive mood can influence how decision makers utilize their DSS, researchers investigating DSS usage and decision behavior should, at a minimum, statistically control for the mood of their subjects. By statistically controlling the mood of the decision makers, future experiments can reduce the error variance in their subjects' decision performance and thus yield better design and analysis. For most experiments, this is fairly easy to do. For example, a mood manipulation questionnaire similar to the one used in this experiment can be used to measure the feeling states of the subjects.

The results have also important implications for the design of a DSS. The usefulness and usability of a DSS is strongly related to its interface [59]. A high quality interface is defined as one that is easy to learn and use [59]. Thus, when designing systems, researchers often focus on constructs such as ease of use, usefulness, and usability of a computerized decision aid [5]. The results of this study show that positive mood has a significant impact on decision makers' effort. Since literature reports that effort is an important mediator in determining how a decision support tool is used [68], paying attention to how the system's interface may interact with users' feeling state to diminish, increase, or sustain a positive mood could potentially lead to building systems that are used more effectively. In other words, the results of this study suggest that paying attention to users' moods may also be an important factor in building

useful systems. From DSS point of view, these results emphasize the importance of user interface design. These results suggest that investigating the impact of a system's interface on a user's mood, in addition to examining user's reaction to ease of use and usefulness of a system, could potentially help to design more effective systems.

The results also have implications for designing DSS models. There has been evidence that familiarity with the process of using a particular DSS to make decisions can improve the mood of users [45]. When decision makers are familiar with executing a DSS model, or when they are actively involved in building a DSS model, they tend to have a higher expectation of success, which in turn enhances their mood [45]. These findings together with the results of this study suggest that involving decision makers in building and executing a DSS model can improve their mood and consequently their DSS usage. In other words, the results of this study in conjunction with the results of previous studies suggest that decision makers' judgment quality may improve when they build and execute their DSS model compared to the situations when they are merely provided with the results (e.g., another individual is assigned to build, enter the data, and execute the model for them).

It is important to note that it may not always be desirable to improve the mood of users by increasing their expectation of success. This is because people who have higher expectations of success are less likely to switch their DSS model even when it is more appropriate to do so [45]. However, in situations where it is determined that a particular DSS model is superior to its alternatives (i.e., it is desirable to keep using the superior model) active involvement and familiarity with a DSS can serve as an appropriate method to improve decision makers' mood and thus, according to the results of this study, their effective usage of a DSS.

This study has important practical implications as well. The results of this study show that decision makers in positive mood made more accurate decisions and used their DSS more effectively. Thus, by paying attention to the affective states of their decision makers, organizations can not only benefit from such improved performance (i.e., improved decision accuracy) but can also benefit from the

increased returns on their IT investments (i.e., improved effective IT usage). One may argue that it is not practical to manage individuals' moods in an organization. Research, however, suggests that simple accommodations such as pleasant physical work environments can improve employees' affect at work [3,34]. Literature suggests that the most productive way to cultivate positive affect in an organization is to help employees find positive meaning in their daily work [21,57]. Organizations can promote positive meaning at work by fostering experiences such as social connections, achievement, involvement, and significance [14,17,18,21,57,58,73]. Fredrickson [21] argues that such experiences can be promoted in an organization through a variety of ways such as "incentives and reward structures, group size, methods of communication, and opportunities for refueling and reflection." Promoting positive meaning at work creates a positive organizational climate [21]. Positive organizational climate in turn improves employees' moods [21,34]. Thus, cultivating positive feelings by promoting positive meaning at work creates a "spiral effect" that can foster positive affect in an organization [21].

As with all laboratory experiments the generalizability of the results of this study is limited by the laboratory setting and the task used. Although laboratory experiments provide the necessary control over desired variables and facilitate more precision in manipulating, controlling, and measuring their effects [64,65], as in all laboratory experiments, care must be taken when generalizing the results. This study reduced the threats to external validity by designing the experimental setting to capture relevant aspects of real decision tasks and calibrated the task by real world data.

The generalizability of the result of this study is also limited by the use of student subjects. Although subjects in this study were business students training to become managers, they were not experienced in the task. The objective of this study was to investigate the impact of positive mood on the utilization of information provided by a DSS as well as accuracy of judgments using the provided information. Thus, subjects were required to use the information provided by the DSS (not their experience) in order to improve their judgments. In such situations it is acceptable to use students who are not experienced in the task [13,65]. Thus, the results of this study are applicable to decision makers

learning a new task or adopting a new DSS. Literature suggests that the enhancing effect of positive mood in decision making is not limited to novice judges. For example, physicians induced with positive mood, compared to their neutral mood counterparts, were significantly more flexible and efficient in integrating information into decisions when diagnosing cancer [16]. Since the ability to efficiently integrate information at hand was the argument used in the hypotheses of this study, it is reasonable to speculate that the results of this study may also generalize to the experienced decision makers using a DSS. Future studies, however, are needed to examine whether experience can mediate the mood effects on DSS usage observed in this study.

The results of this study provide motivation and direction for future investigations of decision models in the DSS literature. For example, this study can be extended to examine the impact of positive mood on DSS strategy and model selection. Since positive moods are common and pervasive [15,31,33,40,50], it becomes important to investigate how these moods can impact the way decision makers select their DSS strategy and model.

This study can also be extended to examine the effects of negative mood on decision behaviors using a DSS. Literature suggests that negative moods can also impact cognition and behavior [12,21]. For example, it has been shown that negative feelings can influence users' satisfaction with an IS system [72]. Given the importance of computerized decision aids in today's business environment, it is necessary to investigate whether negative moods can influence the effective usage of a DSS. Since the theoretical foundation for the effects of positive and negative moods are not the same [21,30], and since the behavioral effects of negative mood are more complex and diverse than those of positive mood [12,24,30,33,40,53], the theoretical arguments of such investigations must be re-developed.

In summary, through an experimental study, the impact of positive mood on the effective usage of a DSS was examined. Grounded in the positive mood theory [33,40], this study hypothesized that positive mood can significantly influence the effort and accuracy measures of a judgment when using a DSS. The results of this study supported its hypotheses. These results have significant theoretical

importance, since much of the current decision making theories assume rational actors who are not influenced by their feeling states when making judgments. From a theoretical point of view, the results of this study expand the current theories of decision making in DSS and judgment literature by supporting positive mood as an important variable in such models. From a practical point of view, this study helps to define a situation where positive mood may be most advantageous to decision makers. In addition, the results provide support for the importance of interface design in building effective decision support systems.

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