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Design and evaluation of a group support system supported process to resolve cognitive conflicts

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ABSTRACT

It is commonplace to have teams of employees working together in the workplace based on the belief that the exchange and leveraging of ideas can result in superior performance. Teams are typically comprised of individuals who come from different backgrounds, have varied experiences, knowledge and values, which they can use to address the tasks at hand. Such differences, however, can also result in conflicts within the team which can be detrimental to team performance. Among the different types of conflict, cognitive conflict is not the outcome of conflict of interest; rather the team members view a task from different perspectives even when they have similar interests in achieving an outcome. We propose and test a group judgment making process architecture supported by group support system (GSS) that we argue will reduce cognitive conflicts and result in solutions that the group members can understand and agree on. It utilizes the multi-attribute utility (MAU) multicriteria decision making technique to structure information and also includes a mechanism for incorporating participant feedback at various stages of the process that should contribute to participants being better able to share values, experiences, and information and obtain a better understanding of the trade-offs that need to be made. When we compared our group judgment making process to a conventional face-to-face group meeting approach as well as a GSS supported process without any required structured decision making process, we found it to be more effective based on four measures of attitude towards the formed group judgment.

1. Introduction

It is common in organizations to form work groups to accomplish complex tasks that use various processes related to the gathering, processing, and the evaluation of information. It has been argued in prior research that such groups benefit from the being able to pool knowledge to stimulate creativity among group members (March & Sutton, 1997). In addition there is general consensus that group work stimulates creativity among group members, balances biases and helps in the detection of errors. Not surprisingly, group work is generally preferred to individual work. Yet, group decision-making behavior has been found to be lacking in many respects (Huber & Lewis, 2010). Team members often have different backgrounds, experiences, and employ different mental models. In addressing problems, they tend to categorize information based on their individual mental models and then apply their preferred experiential judgments and precedents. That, in turn, leads to disagreements and conflicts. This problem is likely to be exacerbated in multidisciplinary teams. Given that disciplines have their own culture, problem solving approaches and domain-specific language (Badke-Schaub, Goldschmidt, & Meijer, 2010) there are likely to be greater differences in terms of opinions, concerns, goals and values. If conflicts among team members are not managed (or, managed inadequately), it reduces the satisfaction of the team members, adversely impacting their organizational commitments. In addition, conflicts contribute to reduced connectedness among team members, resulting in poor teamwork (De Dreu & Weingart, 2003).

While the general perception is that group conflicts have negative implications from the perspective of team chemistry and productivity, it can be argued that this is not necessarily true. Indeed, some type of conflicts may positive implications in the form of higher productivity and innovativeness (Xie, Wang, & Luan, 2014). Conflicts can be classified into three broad categories: affective or interpersonal conflicts, task-based or cognitive conflicts, and process conflicts (de Wit, Greer, & Jehn, 2012). Affective conflicts, which deal with interpersonal relationships or incompatibilities that are not directly related to group tasks typically generate negative emotions and cause unsatisfactory relationships among team members (Behfar, Peterson, Mannix, & Trochim, 2008). On the other hand, cognitive conflicts are often a function of

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differences in opinion about a task among team members (Jehn, 1997). Take, for example, a situation where a committee is assigned the task of selecting a business intelligence software for the firm's needs. While all committee members are likely to agree that the best matching software ought to be picked, there might be significant differences in their view on what criteria ought to be used in matching different software to company needs. Process conflicts are also related to tasks, but involve disagreements on how tasks ought to be accomplished (e.g., the composition of the team and the division of work among team members) (Jehn, 1997). As Jehn (1997) observes, in situations where there is greater cognitive diversity among team members, deliberations among participants reflect the benefits associated with the greater breadth of knowledge and information that can be brought to bear on the decision making process. So long as affective conflicts are avoided, the teams in such cases can be expected to make better decisions (Mooney, Holahan, & Amason, 2007).

At the same time, the variety of beliefs and values that a group member brings to the discussion can be an obstacle. This is particularly true when the individual is unable to consistently apply her beliefs and values to process information related to decisions that they as a group are attempting to make or to understand the positions taken by other members of the group (Sherman, Klein, Laskey, & Wyer, 1998). It can be attributed to the fact that an individual's values and beliefs are not ordinarily stored in memory, but are constructed based on related experiential memory and other information (Anderson, 1986). In such circumstances, an explanation of a person's value system may help her to apply her beliefs and values in a consistent manner. The explanations can be generated via a structured group interaction technique using decision aids (computerized or otherwise) in a role-assigned group (Vathanophas & Liang, 2007). The goal of the exercise would be to reduce cognitive conflict and improve problems by clarifying values and structuring interactions.

The objective of this study is to propose and test a group judgment making process supported by group support system (GSS) that reduces cognitive conflicts to arrive at agreed solutions that is better understood by group members. The process utilizes the multi-attribute utility (MAU) multicriteria decision making technique to structure the information and is adapted to include feedbacks at various stages that guide the participants to share values, experiences, and information and gain a better insight into tradeoffs that must be made. We then compare the MAU theory based, iterative GSS supported group judgment making process with a conventional face-to-face group meeting approach as well as a GSS supported meeting that does not have any required structuring technique in a laboratory setting.

2. Theoretical background

Hammond (1965) introduced and explained cognitive conflict using Brunswik's theory of probabilistic functionalism (1955). Brunswik's theory and its derivative, the lens model (Hursch, Hammond, & Hursch, 1964) presented the theoretical underpinnings for the social judgment theory (SJT) that has been used to study cognitive conflict. According to the SJT model, individuals evaluate complex environmental patterns or events on the basis of a variety of cues, but only probabilistically. That is, if a certain set of cues is present, there is a greater likelihood of a certain environmental condition to occur. The SJT model involves a set of criterion events and a set of cues. Judgments about those events are based on an observation of such cues by a set of individuals. The model has four components: (a) an organizing principle by which cues, which are stimuli serving as indicators of those environmental events, are combined, often in a linear fashion; (b) weights that reflect the relative importance of various cues from the perspective of individuals evaluating the events; (c) function forms that relate cues to environmental patterns and individual judgments; and (d) the consistency with which cues predict events given the proper function form (Brehmer, 1976). When two or more individuals are trying to arrive at an agreement on a common problem, their disagreement may be based on underlying differences in the structure of their judgments – the way they weigh the cues, the organizing principle, and the function form. This pattern or structure of judgments is called the individual's judgment policy (McGrath, 1984). The extent of agreement between a pair of individuals can be represented by Tucker's version of the lens model via the following equation:

$$r_A = GR_{S1}R_{S2} \tag{1}$$

where r_A is the correlation between the judgments made by individual S1 and those made by individual S2. Therefore, r_A is an index of the extent of agreement between S1 and S2. G indicates the extent of similarities between the judgment policies of S1 and S2. The factors R_{S1} and R_{S2} are multiple correlations between cues and judgments made by S1 and S2 respectively, thus measuring the consistency of judgment policies of each group member.

There are two possible sources of disagreement within the group: (a) differences in judgment policies amongst group members as revealed by a low value of G, and (b) inconsistency by any one member in using a policy which is indicated by a low value of R_{S1} or R_{S2}. According to the SJT model, most judgment policies may be represented as a linear combination of cues (Brehmer, 1976). The linear model can be represented by

$$y_i = \sum_{k=1,m} b_{ik}x_k \tag{2}$$

where y_i is the judgment of individual i, m is the number of cues, b_{ik} is the weight for individual i on cue k, x_k is the value of cue k.

Aside from the role of SJT in explaining cognitive conflicts, other sources of cognitive conflict are traced to group process losses, conflicts among multiple cues of the judgment problem, and limited human information processing capability (Bose, 2009). However, group process characteristics (e.g., domination by a few group members, evaluation apprehension, and "free riding" wherein members abstain from participating and rely on others to accomplish the group task) may suppress one's cognitive orientation from being shared, thereby holding back the resolution of cognitive conflicts. On the other hand, group process gains, such as synergy from information being shared in the group and mirage detection (in which groups are better able to detect errors than individuals) can allay misconceptions related to the role of cognitive conflicts in group decision making. Multiple studies have shown that group support systems, when designed appropriately, can mitigate group process losses while enhancing process gains (Lewis, 2010). We expect group support systems to play an important role in reducing cognitive conflicts by structuring communications and information sharing as incorporated in the proposed design.

Conflicts over judgment policies typically relate to disagreements over the relative importance of various goals rather than what goals are important, the goals themselves being often in agreement (Edwards, 1977). For example, group members may agree on the specific features of a business intelligence software that best fits a firm's needs but may disagree on the relative importance of the features. A multicriteria decision-making technique using multi-attribute utility (MAU) measurements can reduce the extent of such differences by making explicit the values of each decision maker and clearly indicating how they differ (Cook & Hammond, 1982; Keeney & Raiffa, 1976). Multicriteria decision making methods (MCDM) in various forms have been applied to