Group Creativity: The Effects of Extrinsic, Intrinsic, and Obligation Motivations

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ABSTRACT: Creativity-reducing extrinsic motivation generally has been associated with rewards tied to task performance. However, there is also evidence that creativity-affecting motivation may also result from extrinsic rewards that are not tied to task performance. This type of motivation may be due to feelings of obligation. A research model is developed that examined how such obligation motivation differs from extrinsic and intrinsic motivations in terms of influencing creativity. Given the importance of groups in organizations, the focus is on motivation and creativity within interacting groups. A laboratory experiment is performed that involved groups determining requirements for an academic information system. The results support a conceptual differentiation between the three types of motivation.

The creativity of interacting groups is becoming increasingly important in organizations (West, 2002; Williams & Yang, 1999) and has gained an increasing amount of research attention. This research has examined the effects of group characteristics (size, diversity, cohesiveness, potency, autonomy, cooperation, type of leader support, and degree of structure: Abbey & Dickson, 1983; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Craig & Kelly, 1999; Nemeth & Kwan, 1985; Redmond, Mumford, & Teach, 1993; Sosik, Avolio, & Kahai, 1997, 1998; Thornburg, 1991) and task characteristics (time pressure and group support systems: Karau & Kelly, 1992; Kelly & Karau, 1993; Kelly & McGrath, 1985; Ocker, Hiltz, Turow, & Fjermestad, 1995–1996; Satzinger, Garfield, & Nagasundaram, 1999). However, the influence of motivation on group creativity has received little attention to date; this is interesting since motivation has been a major focus of individual creativity research (Eisenberger & Cameron, 1996; Hennessey & Amabile, 1998). Group process theorists have argued that there is value in investigating whether individual-level phenomena also occur at the group level (Hinsz, Tindale, & Vollrath, 1997), and so it is reasonable to examine the effects of motivation on group-level creativity.

Two types of motivation are typically addressed in the creativity literature. Extrinsic motivation results from individuals perceiving an instrumental connection between their behavior and their receipt of extrinsic rewards, such as money and praise (Deci & Ryan, 1985). This motivation typically reduces individuals’ creativity (Amabile, 1988; Collins & Amabile, 1999; Hennessey, 2000) because they tend to focus on the rewards rather than on the task itself (Amabile, 1996). As a result, individuals may be distracted from creativity-relevant aspects of the task and/or may exhibit functional fixedness or other forms of cognitive rigidity, with their efforts narrowly focused on the task as originally defined and on common algorithms that have worked well in the past (Hogarth, 1987; Staw, 1990; Woodman, Sawyer, & Griffin, 1993). In con-
In contrast, intrinsic motivation arises from positive reactions to qualities of the task itself; intrinsically motivated individuals engage in a task primarily out of their own interest in it (Lepper, Greene, & Nisbett, 1973). Because they enjoy the task itself and the process of searching for new solutions, intrinsically motivated individuals are more likely to expend energy exploring the problem and find creative solutions (Hennessey, 2000; Staw, 1990; Woodman et al., 1993).

There may be a third type of motivation important for creativity that comes from individuals’ feelings of obligation. This motivation has characteristics in common with extrinsic motivation in that it is linked to extrinsic rewards. However, in contrast to extrinsic motivation, rewards that may result in obligation motivation are not contingent on task performance. For example, rewards that can result in obligation motivation are given for merely being present during a task. This article examines the existence of obligation motivation and how it compares to extrinsic and intrinsic motivations in its influence on group creativity.

Theory and Research Model

This section provides a deeper level of understanding of creativity and motivation, including issues surrounding the conceptualization of motivation at the group level. The research model and hypotheses are then described.

Creativity

Organizational creativity results from individuals working together on a task in a complex social system and taking a more heuristic than algorithmic approach with an outcome consisting of a useful and novel product, service, procedure, or process (Amabile, 1996; Paulus, 2000; Woodman et al., 1993). Useful outcomes are those appropriate for the task and task goals. Novel outcomes can be illustrated in terms of paradigm modification (Nagasundaram & Bostrom, 1995), which can be viewed as changes to organizational elements and changes to relationships among those elements. The highest degree of novelty occurs when substantial changes are made to organizational elements and their relationships. For example, Cooper (2000) described creativity associated with new imaging information technology in terms of radical changes in departments by facilitating the changing or eliminating of departmental boundaries, job descriptions, and work flows. In contrast, he described a lack of creativity as being reflected in an automation of manual processes without significant changes to current departmental boundaries, job descriptions, and work flows.

The capacity for cross-fertilization of ideas along with thorough problem exploration makes interacting groups potentially more creative than individuals or nominal groups (Paulus, 2000; Thompson, 2003; West, 2002). Group members’ task-relevant knowledge and technical skills as well as creativity-relevant cognitive skills and personality traits are important for such cross-fertilization; however, task motivation is key to group creativity since it reflects group members’ drive and determines what they will do (Amabile, 1990; Barron & Harrington, 1981; Hennessey, 2000; Woodman et al., 1993). For example, sufficient motivation can reduce the degree of social loafing and free riding (Baron, Kerr, & Miller, 1992; Kerr & Bruun, 1983; Latané et al., 1979; Sweeney, 1973), which would otherwise reduce group member participation and thereby inhibit the degree of cross-fertilization. Motivation also affects creativity by influencing the use of members’ knowledge and cognitive and technical skills, thereby affecting the degree of exploration and the likelihood that alternative (and potentially more novel) response possibilities will be examined (Amabile, 1988).

Individual Motivation

Prior to examining group motivation, motivation at the individual level is explored. The most popular nonacademic conceptualization of motivation is in terms of the verb to want (Higgins & Kruglanski, 2000a). Excluding habits and automatic responses (e.g., Cooper & Bhattacherjee, 2001; Mischel & Shoda, 1995; Zajonc, 1980), it is motivation that converts cognition into action (Siegel & Ramanuaskas-Marconi, 1989; Sorrentino & Higgins, 1986). Theories that have examined this conversion process commonly focused on anticipatory thought in the form of expectancy models (Bandura, 1986; Bowditch & Buono, 1990; Higgins & Kruglanski, 2000b; Naylor et al., 1980).

For example, Atkinson (1957) described an individual’s motivation to perform a task as being a function of:
Motivation to perform a task =
\[ \sum_{i=1}^{n} f(Motive_i \times Expectancy_i \times Incentive_i) \]

where \( i \) refers to a potential outcome associated with the task, \( Motive_i \) is a relatively stable energizing drive (e.g., maximizing satisfaction associated with achievement or minimizing pain associated with humiliation) associated with outcome \( i \), \( Expectancy_i \) is the subjective probability that the task will be followed by outcome \( i \), and \( Incentive_i \) is the relative attractiveness or unattractiveness (i.e., valence) of outcome \( i \). In addition to task choice, motivation is crucial to the “vigor of the (task activities) … and for its tendency to persist over time” (Atkinson, 1957).

Therefore, faced with a choice between task A and B, an individual will tend to choose A if the motivation associated with A is larger than that associated with B. In addition, the time and energy applied to task A activities would then be a positive function of task A motivation.

Individuals’ motivations have been described as coming from both extrinsic and intrinsic sources (Bandura, 1986; Deci & Ryan, 1985). Some theorists have been unclear whether extrinsic and intrinsic motivations are conceptually distinct; for example, they have treated intrinsic and extrinsic motivation as opposite ends of a single dimension (e.g., Harter, 1981; Newman, 1990). However, many theorists have distinguished between intrinsic and extrinsic motivation (e.g., Lepper & Henderlong, 2000; Naylor et al., 1980; Staw, 1977) and have proposed that this distinction is important for creativity (e.g., Amabile, Hill, Hennessey, & Tighe, 1994; Woodman, et al., 1993). Atkinson’s model described above focuses on an individual’s general evaluation of motive and incentive associated with task outcomes. In contrast, Staw’s (1977) expectancy model differentiates between extrinsic and intrinsic outcomes and adds the potential value associated with task behavior for its own sake. From Staw’s perspective (see Figure 1):

Motivation to perform a task =
\[ f[\sum_{i=1}^{n} P_1 P_2(EV_i) + \sum_{i=1}^{n} P_3(EV_i) + IV_{beh} + P_4(IV_{acc})] \]
where \( EV_i \) = extrinsic valence associated with extrinsic outcome; \( IV_{beh} \) = intrinsic valence associated with task behavior; \( IV_{acc} \) = intrinsic valence associated with task accomplishment; \( P_1 \) = probability that task behavior will lead to task accomplishment; \( P_2a \) = probability that task accomplishment will lead to extrinsic outcome; \( P_3a \) = probability that task behavior will lead directly to extrinsic outcome. 

Here, extrinsic outcome includes monetary rewards, desirable working conditions, and supervisor recognition. These outcomes can result from task accomplishment. For example, monetary bonuses and recognition may result from an individual successfully developing a new information system. In this case, \( P_1P_2a(EV_i) \) represents the associated expected valence. Extrinsic outcome can also result from task behaviors alone. For example, an individual might earn a salary or supervisor recognition for merely attempting to develop a new information system, and \( P_3a(EV_i) \) represents the associated expected valence. These valences involve Atkinson’s notions of motive and incentive, and are related to how well the outcomes are perceived as satisfying the individual’s needs. For example, Maslow (1954) recognized an individual’s need for self-esteem, which can be satisfied by recognition from an individual’s supervisor.

Need satisfaction can also be derived from outcomes intrinsic to task behavior. For example, enjoyment of task behaviors has been found to be important for creativity (e.g., Amabile, 1996; Elam & Mead, 1990). These outcomes are independent of any rewards or recognition by others and help to satisfy individuals’ needs for pleasure. Because the probability that a behavior will result in its associated intrinsic outcome approximates one, \( IV_{beh} \) represents the expected intrinsic valence. In addition, need satisfaction can come from outcomes intrinsic to task accomplishment. For example, accomplishment of the task independent of any rewards or recognition by others can satisfy an individual’s need for self-efficacy. In this case, an individual may enjoy the challenge associated with successfully creating information systems solutions that satisfy conflicting user requirements; \( P_1(IV_{acc}) \) represents the associated expected intrinsic valence.

Cognitive evaluation theory suggests that extrinsic motivation occurs when behaviors are perceived as instrumental in getting rewards (Deci & Ryan, 1985). From this perspective, rewards given that are not contingent on task performance (e.g., rewards given for merely being present during a task) should not be associated with instrumental task-accomplishment behavior and therefore should not result in extrinsic motivation. However, this view appears to be contradicted by recent findings that creativity-reducing motivation can be fostered even when rewards are received prior to task engagement (Amabile, Henesssey, & Grossman, 1986). In addition, individuals’ self-evaluations have been found to decrease creativity (Szymanski & Harkins, 1992). Taken together, this suggests that obligation may play an important role in motivation. Such obligation motivation differs from extrinsic motivation in that it is linked to rewards that are not contingent on task performance; it differs from intrinsic motivation in that it is linked to extrinsic rewards.

There appears to be a powerful rule of reciprocation that is pervasive in all human societies, and which results in our feeling obligated to the future repayment of help, favors, and gifts (Cialdini, 1993; Eisenberger et al., 2001; Gouldner, 1960). This sense of obligation has been credited with the notion of being human (Leakey & Lewin, 1978), with enabling the division of labor thereby facilitating the human adaptive ability (Tiger & Fox, 1971), and with facilitating systems of aid, gift giving, defense, and trade (Cialdini, 1993). Therefore, human societies train their members to comply with and believe in it (Cialdini, 1993) and moral tales of reciprocity proliferate in literature and lore, such as that by Aesop and Dr. Seuss (Whatley, Webster, Smith, & Rhodes, 1999). Such obligation can be felt toward organizations as well as individuals (Eisenberger et al., 2001; Rhoades, Eisenberger, & Armeli, 2001).

Obligation results in part from internalized pressures to be consistent with one’s value system (Whatley et al., 1999) and to help maintain one’s positive self-image as one who repays debts (Eisenberger et al., 2001; Harrison, 1995). Failing to fulfill such obligations can result in self-reproach and guilt (Whatley et al., 1999). Though internal pressure may not be instrumental in receiving extrinsic rewards, it can result in behavior much like extrinsic motivation since an individual’s freedom to act is constrained (Goei et al., 2003) because he or she feels pressure to behave in ways he or she believes others (the reward givers) would like him or her to behave (Gouldner, 1960). In addition, meeting obligations can be instrumental in the sense that it helps individuals avoid the social stigma associated with the reciprocity norm’s violation.
Aggregating Individuals’ Motivations

Although the previous model focuses on individuals’ tasks, it can be augmented to reflect individuals’ motivations to perform group tasks (Shamir, 1990). First, the model can be expanded to include the expectation that individual effort will result in the group’s task performance. This expectation would be affected by an individual’s evaluation of other group members’ abilities as well as group leadership, group cohesiveness, and group effectiveness. Second, when considering extrinsic and obligation outcomes directly affected by an individual’s task behaviors, social acceptance of an individual by the group can be included because it often depends on social judgments about the individual’s contributions and adherence to norms, which typically relate to behavior independent of task performance.

A question remains as to whether and how individuals’ motivations can be aggregated to enable group-level analyses. Hackman and Morris (1975) and Weingart (1992) refer to a general notion of group motivation, which reflects the amount of time and energy group members are willing to apply to a group task. However the translation of individual members’ motivations to group motivation is not necessarily straightforward. Aggregation of individual-level measures to form or reflect group-level constructs can be inappropriate when the individual-level measures demonstrate a shared understanding among group members about some group or contextual characteristic. This approach has been used to reflect group aspirations (Zander & Medow, 1963), collective self-esteem (Crocker & Luhtanen, 1990), and group potency (Guzzo, Yost, Campbell, & Shea, 1993). Such approaches typically base their validity on the assumption that there is low variance among the individual measures within each group (e.g., Sosik et al., 1997).

However, a shared understanding of some group or contextual characteristic is not of interest here. Rather, of interest is a measure that reflects the time and energy (i.e., motivation: Naylor et al., 1980) that group members are willing to devote to a group task. If one were interested in developing a group attribute called motivation, a sophisticated model of motivation-oriented group dynamics that includes notions of cohesion, norms, and leadership (Hackman & Morris, 1975; Shamir, 1990; Woodman et al., 1993) might be used along with the measures of individual group members’ motivations (LePine, Hollebeck, Ilgen, & Hedlund, 1997). Nevertheless, without such a model, one can still aggregate individual members’ motivations within a group and employ them as an estimate in group-level analyses with the understanding that these motivations are resources that can be employed by the group and are related to the level of time and energy that the group will employ on a task (LePine et al., 1997).

An aggregation approach that has been used in such situations is that proposed by Steiner (1972), which is based on the assumption that significant variation does exist among individuals within a
group. This approach has been employed to characterize groups in terms of individual members’ creativity, intelligence, physical strength, and conscientiousness (e.g., Barrick, Stewart, Neubert, & Mount, 1998; Colquitt, Hollenbeck, Ilgen, LePine, & Sheppard, 2002; LePine et al., 1997). Steiner indicates that different tasks may require different uses of member capabilities and therefore different aggregation schemes. With additive tasks, each member’s contribution is important; and the sum (or average with groups of equal sizes) of these contributions is an appropriate group-level indicator. Additive aggregation is appropriate here because, as described earlier, the capacity for cross-fertilization of ideas along with thorough problem exploration is what makes interacting groups potentially more creative than individuals or nominal groups. Thus, the extent to which each individual provides effort is important and can increase group creativity. Therefore, in accord with Barrick et al. (1998), an additive aggregation employing group means is adopted.

In summary, motivation reflects an individual’s willingness to apply time and energy to a task. An individual’s motivation is determined by his or her anticipatory expectations of outcomes that can accrue, and the resultant satisfaction of needs. A reasonable estimate of the amount of time and energy a group is willing to apply to a task can be measured by an additive aggregation of the individuals’ motivations within the group. The following discussions propose the research constructs and their relationships as illustrated in Figure 2.

Extrinsic Motivation and Creativity

As described earlier, extrinsic motivation is other-directed in that it arises from sources outside of the task itself, such as monetary reward and supervisor recognition (Lepper & Henderlong, 2000). In addition, it reduces individuals’ freedom in that their behaviors tend to be confined to actions instrumental in gaining the rewards. This is likely to decrease individuals’ creativity because their attentions are narrowly focused on the task as originally defined and they typically rely on common, well-worked algorithms that they have learned for doing the particular task. However, there are important exceptions to this negative relationship between extrinsic motivation and creativity. Extrinsic motivation can provide individuals the focus and energy necessary for completing a creative task when there are important “tedious hurdles” that are not themselves intrinsically interesting (Amabile, 1988, 1996; Brophy, 1998). For example, when the task is developing information technology requirements, careful validation of ideas can be very important and can be less intrinsically interesting than interviewing and analyzing. This need to effectively perform the less interest-

![Figure 2. Research model. *Must be significant for the associated a and b hypotheses to be supported.](image-url)
ing activities may counter the potentially negative effect of extrinsic motivation on creativity during such tasks. In addition, positive effects of extrinsic motivation have been found when participants have been explicitly told to be creative (Eisenberger & Shanock, 2003). However, in the experiment reported here, groups were not provided the opportunity to carefully validate their ideas and they were not told to be creative. This leads to the following hypothesis.

H1. Extrinsic motivation will decrease group creativity.

(This positive relationship is depicted in Figure 2 as positive.)

Obligation Motivation and Creativity

Obligation motivation is based on the reciprocity norm, and results from an aversive psychological tension that reduces individuals’ freedom of action (Goei et al., 2003). As described earlier, this tension results from individuals’ needs to be consistent with their value systems and to maintain positive self-images. Reciprocating the favor releases this aversive tension, thereby regaining the individual’s freedom of action (Goei et al., 2003). In addition, meeting obligations helps individuals avoid the social stigma associated with violation of the reciprocity norm. These needs to be consistent with value systems and to avoid social ostracism result in a motivation to act in ways that can repay favors. For example, when rewards are given for merely being present in a group activity, repayment can take the form of acting in ways that individuals believe the reward giver would like them to act. This other-directed behavior and constraint on actions is similar to the effects of extrinsic motivation. Therefore, for reasons described earlier associated with the extrinsic motivation hypothesis, the following parallel hypothesis is proposed:

H2. Obligation motivation will decrease group creativity.

Intrinsic Motivation and Creativity

Intrinsic motivation arises from positive reactions to qualities of a task itself; intrinsically motivated individuals engage in a task primarily out of their own interest in it (Lepper et al., 1973). There is agreement among theorists that intrinsic motivation is a psychological state characterized by deep involvement and playfulness (Amabile, 1996). Enjoyment of task behaviors is an intrinsic outcome that provides individuals with the sense of engaging in play rather than work and it helps satisfy their needs for pleasure (Amabile, 1996; Higgins & Kruglanski, 2000a; Staw, 1977). Because they enjoy the task itself and the process of searching for new solutions, intrinsically motivated individuals (a) devote more attention to a task for its own sake rather than as a means to an end, (b) have a willingness and ability to explore alternative cognitive pathways (to step away from a problem to see the nonobvious sides of issues) in problem solving, and (c) attend to apparently incidental aspects of the tasks and environment (Amabile, 1996; Higgins & Kruglanski, 2000a; Staw, 1977). Therefore intrinsically motivated individuals will be more likely expend energy exploring the problem and find creative solutions (Crutchfield, 1962; Hennessey, 2000; Newell, Shaw, & Simon, 1962; Staw, 1990; Woodman et al., 1993). This leads to the following hypothesis:

H3. Intrinsic motivation will increase group creativity.

Rewards and Motivations

Cognitive evaluation theory suggests that extrinsic motivation occurs when behaviors are perceived as instrumental in getting rewards (Deci & Ryan, 1985). For example, rewards tied to task performance will result in greater extrinsic motivation than rewards for merely being present when task activities occur. This impact of instrumentality on motivation has substantial empirical support (Lepper & Henderlong, 2000). Rewards can also be perceived as informational, whereby reward receipt conveys information about the recipient’s competence and self-determination (Deci & Ryan, 1985). This informational aspect can mitigate the negative extrinsic effects by increasing intrinsic motivation (Deci & Ryan, 1985). However, rewards are received after task performance in the experiment reported here, eliminating the potential information effect. This leads to the following hypothesis:

H4. Extrinsic motivation increases as rewards are tied to task performance.
In contrast, the literature on reciprocity suggests that rewards dependent on individuals’ behavior (e.g., individuals feel that rewards are tied to task performance) reduce the level of obligation motivation (Cialdini, 1993; Eisenberger et al., 2001; Gouldner, 1960). This leads to the following hypotheses:

H5. Obligation motivation decreases as rewards are tied to task performance.

(This negative relationship is depicted in Figure 2 as H5a being negative and H5 being positive.)

Decreased intrinsic motivation resulting from expectations of extrinsic rewards has been proposed by several theories (e.g., cognitive evaluation theory: Deci & Ryan, 1985; overjustification hypothesis and self-perception theory: Lepper, 1981, Bem, 1972; social cognitive theory: Bandura, 1986) and is empirically well documented (e.g., Boone & Cummings, 1981; Deci, Koestner, & Ryan, 1999; Jordan, 1986; Staw, 1974). These theories suggest that when behavior is perceived to be instrumental in receiving rewards, individuals can feel less personal interest, less competent, and more behaviorally controlled. This results in a negative emotional tone, the experience of pressure and tension, a decrease in enjoyment, and thereby a decrease in intrinsic motivation (Bandura, 1986; Deci & Ryan, 1985; Lepper, 1981; Szymanski & Harkins, 1992). In addition, research examining extrinsic rewards that are not tied to task performance has found no significant influence on intrinsic motivation (Amabile et al., 1986). This leads to the following hypothesis:

H6. Intrinsic motivation decreases as rewards are tied to task performance.

(This negative relationship is depicted in Figure 2 as H6a being negative and H6 being positive.)

Further, rewards have been found to decrease motivation if they are not perceived as being reasonable compensation for the task (Abbey & Dickson, 1983; Amabile, 1996). Therefore three reasonableness hypotheses are included:

H4b. Extrinsic motivation increases as rewards are perceived as being more reasonable.

H5b. Obligation motivation increases as rewards are perceived as being more reasonable.

H6b. Intrinsic motivation increases as rewards are perceived as being more reasonable.

**Method**

**Experimental Participants**

One hundred thirty-eight senior-level undergraduate students enrolled in multiple sections of an Information Technology Systems Analysis and Design class at a large urban university were participants in the laboratory experiment. Participants were recruited from three semesters to participate in single sessions. Forty-two students participated the first semester, 45 in the second semester, and 51 in the third semester. Participants were randomly assigned to 46 teams of mixed gender, each team consisting of three students.

**Experimental Procedure**

The experimental procedure was as follows. All participants attending an experimental session (typically 9 participants) initially met together in one room. At this time, they were told that the objective of the study was to identify factors that can affect information technology (IT) requirements determination. Each participant was then provided with a copy of the general instructions (see Appendix A.1). The experimenter read the instructions out loud along with the participants and asked if there were any questions. Participants were not told that the experiment concerned creativity. This is in accord with Amabile (1996) and is probably more reflective of IT requirements tasks in general (Mumford, 2003). Participants were told that they would have 60 min to complete their task, after which they would return to the meeting room and fill out a questionnaire regarding their group experiences. Participants were then randomly assigned to groups and to stakeholder roles. Groups were then randomly assigned to treatments and rooms. Each participant was provided with an individual instruction sheet (see Appendix A.2 for an example), which described his or her reward and stakeholder role. Students were informed that they could quit the experiment at any time; and if they quit, they would receive only one extra credit point. Each group met for 60 min in its assigned room, which contained chairs, one table, and a chalk-
board. The experimenter notified each group when there were 15 min remaining.

**Task**

The task for each group involved the determination of changes aimed at improving the University's administrative information systems. Each participant in a group was randomly assigned to represent one of three stakeholders: working students, nonworking students, and faculty. Working and nonworking student representatives were given the following set of stakeholder improvement issues, with “working” or “nonworking” appropriately included:

1. Classes desired by working/nonworking students are not available because they are already closed.
2. Classes desired by working/nonworking students are not available because they are not offered.
3. Classes desired by working/nonworking students are in conflict with each other because they are offered at the same day and time.
4. After registering for a class, working/nonworking students are dropped from the class because it is cancelled by administration, for example, due to too few students taking the class.
5. Classes desired by working/nonworking students are offered at inconvenient days and/or times.

Faculty representatives were given the following set of stakeholder improvement issues:

1. Assigned classes are scheduled for inconvenient days and/or times for faculty members.
2. Assigned classes will require too much work on the part of faculty members.
3. Assigned classes do not interest faculty members.
4. Assigned classes are not appropriate because the faculty member does not understand the material.
5. Assigned classes result in an overload of work to the faculty member due to large class sizes.
6. Required equipment and material for the assigned classes are not available.

At the end of the task, each group handed in a report that described suggestions for administrative information systems improvements in terms of what the system should do and how the proposed changes help resolve the student and faculty issues.

This task is in accord with Torrance’s (1965) suggestion that product (in this case administrative information systems) improvement is an appropriate test for creative behavior. In addition, Amabile (1996) suggested that the task should (a) be heuristic—open ended enough to permit considerable flexibility and novelty in response, (b) result in an observable product or response that can be recorded and later judged on creativity, and (c) be feasible in the sense that virtually all participants in the study can produce something that can be assessed by judges. In accord with Amabile, the task (a) is open ended, with multiple issues and few constraints on solutions, (b) results in a written report to be judged, and (c) is feasible due to students’ familiarity with the issues and the administrative information system. (Note that these issues were identified from an earlier survey of similar students.)

**Operationalization of Constructs**

**Reward.** Hypotheses 4, 5, and 6 require a differentiation between rewards perceived as being tied to task performance and rewards perceived as being independent of task performance. Negotiations with the instructors teaching classes from which student participants were drawn resulted in the following reward conditions. In addition to receiving one (guaranteed) extra credit point for showing up at the experiment, students were given:

1. **Task performance-independent condition**—guaranteed receipt of 2 extra credit points independent of the quality of work.
2. **Task performance condition**—the potential of receiving up to 2 extra credit points depending on the quality of work.

Based on cognitive evaluation theory (Deci & Ryan, 1985), extrinsic motivation should be manifest in the task performance condition due to the instrumentality of behavior. Key to this theory is that the more an individual perceives his or her behavior as being tied to task performance, the greater the degree of extrinsic and the lesser the degree of intrinsic motivations. Per
the aforementioned theoretical discussions, the more an individual perceives his or her behavior as being independent of task performance, the more his or her obligation motivation is expected to be. Therefore, the reward construct includes one formative dummy item that contrasts the two conditions. In addition, Hypotheses 4b, 5b, and 6b require an indication of whether rewards are perceived as being reasonable for the experimental task. Therefore the reward construct also includes a formative item from the posttask questionnaire (see Table 1) that asks the degree to which the reward is reasonable. Because the loadings of these items are significantly different for the motivation constructs, one reward construct is employed for each motivation construct.

**Motivation.** The motivation constructs are measured using posttask questionnaire items (see Table 1). Extrinsic motivation items are in accord with Amabile et al. (1994). Items involving obligation motivation are in accord with Harrison’s (1995) direct approach as well as Eisenberger et al.’s (2001) focus on job performance. Items involving intrinsic motivation are in accord with Amabile (1996), Ryan et al. (1983), and Sansone, Sachau, and Weir (1989).

**Creativity.** A holistic approach, asking experts to judge creativity, was taken to measure the written products (Amabile, 1996). As described later, experts also judged novelty and usefulness to help evaluate the validity of creativity. The experts were administrative personnel who understood student and faculty issues and were very familiar with the administrative information technology currently in use.

In accord with Massetti (1996) and Amabile (1996), the following judging procedure was employed. (a) To reduce distractions, experts were provided with commonly formatted word-processed copies of team reports with spelling and grammatical errors corrected. (b) Reports were in a different random order for each expert to eliminate order effects. (c) Experts were all professionals within the University administration, and

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<th>Table 1. Posttask Questionnaire Items by Construct</th>
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<th><strong>Obligation Motivation</strong></th>
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<td>Eisenberger et al., 2001</td>
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<th><strong>Intrinsic Motivation</strong></th>
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<td>Keys Instrument–Amabile et al., 1996</td>
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<td>Ryan et al., 1983; Sansone et al., 1989</td>
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<th><strong>Reward Reasonableness</strong></th>
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<td>The reward offered is reasonable for this activity.</td>
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<th><strong>Guaranteed Reward</strong></th>
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<td>I am guaranteed to receive the following amount of extra credit: 0 points, 1 point, 2 points, 3 points, 4 points, 5 points.</td>
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*Note.* All items except guaranteed reward were responded to on a 7-point Likert scale, from 1 (*completely disagree*) to 7 (*completely agree*).
were chosen due to their familiarity with the problems and potential solutions facing the students. (d) Experts were asked to work independently from each other and to evaluate each report in terms of creativity, novelty, and usefulness on 7-point scales. In accord with the definition of creativity, experts were asked to use their own subjective notions of creativity. They were asked to evaluate novelty in terms of the degree to which they believe that the team’s solutions are new and unusual. They were asked to evaluate usefulness in terms of the degree to which they believe that the team’s solutions will help solve the associated problems. (e) Experts were asked to make their evaluations relative to all the other teams, rather than on some absolute standard. To facilitate this relative evaluation, they were asked to read all solutions for at least five teams (approximately 20%) before judging any single team.

Control. The model subjected to partial least squares (PLS) analysis has one construct to control for differences across the three semesters that the experiment occurred. This construct has paths to all other constructs and has two dummy items that represent the three semesters.

Results

Descriptive statistics are provided in Tables 2a and 2b. In addition, three analyses of covariance (with reasonableness as a covariate) were run, examining the influence of reward on motivations. Reward was found to have a marginally significant effect ($p = .07$) on extrinsic motivation and nonsignificant effects on obligation and intrinsic motivations. These results are further explored later.

The research model in Figure 2 is analyzed using Partial Least Squares (PLS—version 3.00 build 1017), a multivariate analysis technique for testing structural models that allows the simultaneous analysis of multiple criteria and predictor constructs (Barclay et al., 1995; Wold, 1985). PLS is especially good when there are not many data points; it can be used when there are as few as five for each path leading to the construct that has the most incoming paths or the formative construct with the most indicators, whichever is greater (Falk & Miller, 1992). In PLS, construct indicators may be modeled as reflective or formative (Fornell & Bookstein, 1982), with reflective indicators determined by the construct they represent and formative indicators determining the construct they represent (Chin & Gopal, 1995). Indicators for the extrinsic and obligation motivation constructs in Figure 2 are reflective; those for the creativity, intrinsic motivation, and reward constructs are formative. Many of the reliability and validity discussions below are supported by PLS analyses.

Construct Reliability and Validity

Reward. To determine if participants were able to distinguish between the reward conditions, a correlation was run relating the reward condition dummy

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### Table 2a. Descriptive Statistics for Performance-Independent Reward Condition

<table>
<thead>
<tr>
<th>Construct</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrinsic motivation</td>
<td>24</td>
<td>7</td>
<td>19</td>
<td>12.8</td>
<td>3</td>
</tr>
<tr>
<td>Obligation motivation</td>
<td>24</td>
<td>10.7</td>
<td>48.9</td>
<td>25.5</td>
<td>10.2</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>24</td>
<td>11</td>
<td>17.7</td>
<td>14.3</td>
<td>1.7</td>
</tr>
<tr>
<td>Reasonableness</td>
<td>24</td>
<td>-1.4</td>
<td>7</td>
<td>5.6</td>
<td>0.73</td>
</tr>
<tr>
<td>Creativity</td>
<td>24</td>
<td></td>
<td></td>
<td>0.1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

### Table 2b. Descriptive Statistics for Performance Reward Condition

<table>
<thead>
<tr>
<th>Construct</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrinsic motivation</td>
<td>22</td>
<td>6.7</td>
<td>18.3</td>
<td>14.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Obligation motivation</td>
<td>22</td>
<td>10.5</td>
<td>48.9</td>
<td>29</td>
<td>11.2</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>22</td>
<td>10.7</td>
<td>17.7</td>
<td>14.7</td>
<td>2.0</td>
</tr>
<tr>
<td>Reasonableness</td>
<td>22</td>
<td>3.3</td>
<td>7</td>
<td>5.5</td>
<td>0.85</td>
</tr>
<tr>
<td>Creativity</td>
<td>22</td>
<td>-1.1</td>
<td>1.4</td>
<td>0.1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

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item to a posttask question asking how many extra credit points participants were guaranteed to receive; the result is significant ($r = .70, p = .01$). This suggests that participants appropriately perceived significant differences between the reward conditions, thereby supporting validity of the reward construct.

**Motivation.** PLS enables the assessment of measurement components by providing principal components factor loadings of items. The factor loadings provided by the PLS analysis and presented in Table 3 indicate adequate reliability for the motivation constructs. The loadings are all greater than 0.6, demonstrating that less than half of any indicator’s variance was due to error (Bagozzi & Youjae, 1988). In addition, composite scale reliabilities (an internal consistency estimate similar to Cronbach’s $\alpha$) for the motivation constructs exceed the recommended cutoff of 0.7 (Fornell & Larcker, 1981). Finally, average variances extracted by motivation constructs from their items exceed the recommended cutoff of 0.5 (Fornell & Larcker, 1981).

The items of motivation constructs also demonstrate convergent and discriminant validity according to a criterion similar to a multitrait/multimethod analysis (Carmines & Zeller, 1979). Specifically, Table 4 illustrates that the constructs share more variance with their items than with the other constructs.

**Creativity.** Recent research has demonstrated that acceptably reliable assessments can be obtained with as few as three experts for verbal and problem solving tasks (Amabile, 1996). Eight experts were available to us each semester. Because some experts were different in different semesters, their responses are standardized (Chin, Marcolin, & Newsted, 1996) and combined such that each team had one measure for creativity, one for novelty, and one for usefulness. Based on Intraclass Correlation Coefficients (McGraw & Wong, 1996), the interexpert reliability for the first semester is .86 for creativity, .77 for usefulness, and .76 for novelty; that for the second semester is .81 for creativity, .80 for usefulness, and .81 for novelty; and that for the third semester is .77 for creativity, .81 for usefulness, and .82 for novelty. These data demonstrate very good reliability for the subjective judgment measures.

According to Amabile (1996), interexpert reliability (demonstrated earlier) is also equivalent to construct validity because creativity is defined as that which is agreed to among experts to be creative. In addition, novelty and usefulness (the two components of creativity: Amabile, 1996) are significantly related to creativity, accounting for 87% of its variance. This further supports creativity validity.

**Analysis**

Figure 3 depicts PLS analysis of the research model. PLS generates estimates of standardized regression coefficients for the paths in a model’s structural component. To determine the significance of

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**Table 3.** PLS Construct Indicators, Factor Loadings, Average Variances Extracted, and Composite Scale Reliabilities for Reflective Constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Indicators</th>
<th>Range of Factor Loadings</th>
<th>Average Variance Extracted</th>
<th>Composite Scale Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrinsic motivation</td>
<td>Questionnaire items</td>
<td>0.92 to 0.96</td>
<td>0.88</td>
<td>0.96</td>
</tr>
<tr>
<td>Obligation motivation</td>
<td>Questionnaire items</td>
<td>0.91 to 0.93</td>
<td>0.84</td>
<td>0.94</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>Questionnaire items</td>
<td>Not applicable for formative indicators</td>
<td>0.25</td>
<td>0.31</td>
</tr>
</tbody>
</table>

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**Table 4.** Average Variance Extracted by PLS Constructs (Diagonal Elements) and Shared Variance Between Constructs (Off-Diagonal Elements)

<table>
<thead>
<tr>
<th></th>
<th>Extrinsic Motivation</th>
<th>Obligation Motivation</th>
<th>Intrinsic Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrinsic motivation</td>
<td>0.88</td>
<td>0.77</td>
<td>0.25</td>
</tr>
<tr>
<td>Obligation motivation</td>
<td>0.84</td>
<td>0.31</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>0.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
these paths, jackknifed standard error estimates for the
paths are obtained using the blindfolding procedure
with an omission distance of 11 (Sambamurthy &
Chin, 1994). Figure 3 also shows R-square values in
parentheses for motivations and creativity, which is the
proportion of variance of a construct explained by con-
structs having paths leading to it. This analysis leads to
the following hypothesis evaluations.

Effects on creativity were significant, with the ef-
facts of extrinsic and intrinsic motivations supporting
hypotheses (H1 and H3). However, obligation motiva-
tion increased creativity in contrast with expectations
(H2). The effect of reward on extrinsic motivation was
significant (H4a), whereas rewards did not significantly
influence obligation or intrinsic motivations (H5a and
H6a). In contrast, there were consistently strong effects
on all motivations due to reward reasonableness (H4b,
H5b, and H6b).

Discussion

The results provide substantial support for the re-
search model. However, three findings were contrary
to expectations: Rewards did not significantly affect
intrinsic and obligation motivations and obligation
motivation affected creativity in a manner more similar
to intrinsic rather than extrinsic motivation. These is-
ues are addressed next.

Rewards and Motivation

Due to constraints set by instructors of the student
participants, both reward conditions included 1 extra
credit point. The performance condition offered the
opportunity to receive up to 2 more extra credit points
depending on report quality. The performance-inde-
pendent condition gave 2 more extra credit points
merely for being present during the task. Compared
to the performance-independent condition, the perfor-
mance condition significantly increased extrinsic mo-
tivation. However, the contrast between these two
conditions did not significantly affect obligation or
intrinsic motivations. Because both conditions offered
extrinsic rewards, the lack of effect on intrinsic moti-
vation may not be that surprising. The lack of effect
on obligation motivation may be due to perceptions
that, in terms of engendering obligation, the differ-
ce between being guaranteed 1 or 3 extra credit
points was not significant.

Because both reward conditions included some
kind of reward, it appears that variations in perceptions
of reward reasonableness, rather than the reward con-
dition, had more influence on obligation motivation. In

Figure 3. PLS results. All paths are significant (two-tailed) at p = .01 except those noted as “ns” and that with a single asterisk. The single
asterisked path is significant at p = .05; “ns” indicates not significant. § Item weights. ** Direction contrary to hypothesis.
general, Abbey and Dickson (1983) and Amabile (1996) have noted a direct impact of reward reasonableness on motivation. The potential for such effects in this study can be seen in a survey (administered to similar students who did not participate in the experiment) that was used to determine the levels of extra credit rewards. Over 20% of the respondents indicated no difference between the level of extra credit that would entice them to participate and that which would make them work hard. If the rewards were enough to have them sign up for the experiment, additional compensation would presumably not affect their degree of obligation motivation. This would suggest that for many participants there may be a threshold, which, when met, would get them involved, and greater compensation (within the limits of this study’s extra credit rewards) may not have increased effects on obligation motivation. For such individuals, perceptions of reward reasonableness—indicating whether the reward met the threshold—could have more of an impact on obligation than the reward treatment itself.

**Obligation Motivation and Creativity**

Contrary to expectations, obligation motivation had effects on creativity opposite that of extrinsic motivation and in accord with intrinsic motivation. The negative effects of extrinsic motivation on creativity come largely from individuals’ focus on behaviors that are more likely to gain the extrinsic rewards; these behaviors typically do not include extended explorations of the problem space, but rather focus on the technical or rule-bound aspects of task performance (Amabile, 1988; Hogarth, 1987; Woodman et al., 1993). In contrast, the positive effects of intrinsic motivation on creativity come largely from individuals’ behaviors that increase their understanding of the problem itself. This can occur when individuals have an interest in the problem for its own sake (e.g., due to the potential for professional growth or because it is pleasurable) and have the necessary autonomy to enable extensive problem space exploration (Amabile, 1988; Hogarth, 1987; Woodman et al., 1993).

Implications for behavior due to obligation motivation can be more ambiguous than that associated with extrinsic motivation. In the case of this experiment, obligation came from the receipt of extra credit that was guaranteed, independent of task performance. The appropriate reciprocation of this favor was not described. If participants believed that participation in the task would be reasonable reciprocation, then they would feel freer to explore the problem space than would extrinsically motivated participants. In addition, because the act of participating is an act of repayment, participation could reduce the aversive psychological tension caused by obligation, thereby increasing pleasure associated with the task itself. Therefore, the type of obligation motivation provided here could result in a degree of pleasure and autonomy more associated with intrinsic rather than extrinsic motivation. Though this rationale is clearly speculative, it is supported by the analysis illustrated in Figure 4: Intrinsic motivation is decreased by extrinsic and increased by obligation motivation.

**Conclusion**

The purpose of this article was to examine the degree to which obligation motivation differs from extrinsic and intrinsic motivations in terms of their effects on group creativity. Results of the laboratory experiment support the existence of obligation motivation and indicate that it can have effects on creativity that are more in line with intrinsic rather than extrinsic motivation. In addition, the experiment
demonstrated that reward reasonableness can be a very important factor influencing the degree of all three motivations.

Several potentially fruitful areas of research are suggested by the experiment. (a) Though the creativity of interacting groups was examined, this examination was at a rudimentary level because simple aggregations of individual-level responses were employed to represent group motivation. Though this is a reasonable first step, future research should attempt to model motivation-oriented group dynamics, including notions of cohesion, norms, and leadership (Hackman & Morris, 1975; Shamir, 1990; Woodman et al., 1993). (b) The potential for motivations to affect group creativity suggests the potential for examining relationships among the three motivations and group characteristics and processes that lead to creativity. (c) The surprisingly strong effects of reward reasonableness on the motivations suggest research questions involving what affects perceptions of reward reasonableness and why such perceptions affect motivation.

References
Chin, W., Marcolin, B. L., & Newsted, P. R. (1996). A partial least squares latent variable modeling approach for measuring inter-action effects: Results from a monte carlo simulation study and voice mail emotion/adoption study. In J. DeGross, S. Jarvenpaa, & A. Srinivasan (Eds.), Proceedings of the Seventeenth International Conference on Information Systems (pp. 21–41). Cleveland, OH.


Mischel, W., & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions,
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dynamics, and invariance in personality structure. Psychological Review, 102, 246–268.

**Appendix A.1: General Instructions**

Students are faced with problems when attempting to register and take classes at the University of Houston. These problems may be different depending on whether a student is also working at a job. For example, nonworking students may have trouble getting classes because the ones they want are not being offered. Working students may have trouble getting classes because the ones they want are being offered at the times they have to go to work. In addition, faculty members have problems with classes they are assigned. For example, they may be assigned classes for which they do not understand the material.

You will be assigned to a group; each group will consist of 3 students. One of you will represent faculty and will be provided with a list of faculty problems that need to be solved. One will represent working students, and will be provided with a list of working-student problems that need to be solved. One will represent nonworking students, and will be provided with a list of nonworking-student problems that need to be solved. The task for your group is to develop *Information System Specifications* to help solve these problems. Please *do not* attempt to solve problems other than the ones you are given.

Due to budget constraints, additional faculty, TAs, classrooms, etc. cannot be provided. However, the University administration has suggested that an *Information System* might help that can perform activities such as scheduling classes, assigning classrooms, allocating equipment and material, etc. Your group’s task is to provide the administration with a list of Information System functions (what the *Information System* should do) to help solve the student and faculty problems. Remember, your solutions MUST BE *information system* solutions. Therefore, for example, having the University provide more classes is *NOT* an appropriate solution because it means that additional faculty must be hired. **Hiring more faculty IS NOT AN INFORMATION SYSTEMS SOLUTION.**

**Deliverables**

Please hand in the following in the ‘Group Report’ forms provided to you.

1. **Information Systems Functions:** Describe what the *Information System* should do. Provide enough detail to resolve potential conflicts among nonworking students, working students, and faculty.

2. **Problems:** Specifically relate how the *Information System* functions help solve the problems of nonworking students, working students, and faculty members that were provided to you in the individual instruction sheets.

3. **Prioritization:** Due to budget constraints, the University administration may not be able to implement all of your described functions. Therefore, prioritize the *Information System* functions in order of their importance.

You will have 1 hour to complete your answers. Please be sure that your answers are *appropriate*, have the right level of *detail*, and are *complete*.

Please do not discuss any part of this exercise with any other students until we announce in class that the exercise is over. (Thanks!!)

Note: The Third Deliverable (Prioritization) was not examined in this article.

**Appendix A.2: Example of the TASK INDEPENDENT Instruction Sheet**

**WORKING STUDENTS**

*Important: Though you may discuss these instructions, please do not show these instructions to other members of your group*

In class, it was announced that you could earn from 1 to 3 extra credit points. **HOWEVER**, each member of your group *WILL* receive 3 extra credit points. Your receipt of these 3 points is guaranteed (you will get the 3 points no matter
what), and does NOT depend on the quality of work that you do.

Students who are attending the university and are working at a full-time job are faced with problems when attempting to register and take classes at the campus. You represent these working students in the group activity you are about to perform. Other members of YOUR group represent faculty members and part-time students.

The following lists the problems faced by the working students you represent:

1. Classes desired by working students are not available because they are already closed
2. Classes desired by working students are not available because they are not offered
3. Classes desired by working students are in conflict with each other since they are offered at the same day and time
4. After registering for a class, working students are dropped from the class because it is cancelled by administration, e.g. due to too few students taking the class
5. Classes desired by working students are offered at inconvenient days and/or times.

Appendix B
Judges’ Instruction Sheet

Instructions for Group Evaluations

BACKGROUND:

Undergraduate Seniors in the College of Business Administration were put into groups of three students each, and asked to provide information systems solutions to help solve one or more of the following 11 problems.

1. Classes desired by working/nonworking students are not available because they are already closed.
2. Classes desired by working/nonworking students are not available because they are not offered.
3. Classes desired by working/nonworking students are in conflict with each other since they are offered at the same day and time.
4. After registering for a class, working/nonworking students are dropped from the class because it is cancelled by administration, e.g. due to too few students taking the class.
5. Classes desired by working/nonworking students are offered at inconvenient days and/or times.
6. Assigned classes are scheduled for inconvenient days and/or times for faculty members.
7. Assigned classes will require too much work on the part of faculty members.
8. Assigned classes do not interest faculty members.
9. Assigned classes are not appropriate because the faculty member does not understand the material.
10. Assigned classes result in an overload of work to the faculty member due to large class sizes.
11. Required equipment and material for the classes assigned to faculty are not available.

Each group has proposed solutions to one or more of the above problems. Groups have indicated which problem or problems each solution is proposed to help solve. We would like you to evaluate their solutions in terms of Creativity, Usefulness, and Novelty. Please use your own subjective definition of Creativity. Usefulness should be evaluated in terms of the degree to which you believe that their solutions will help solve the associated problems. Novelty should be evaluated in terms of the degree to which you believe that their solutions are new and unusual.

Each solution has the following format:

This IS function should:

This reduces the following problem for

by doing, performing, etc. the following:

Most groups have included a number of solutions in the above format. For each group, please evaluate the group’s overall Creativity, Usefulness, and Novelty, considering all of their solutions together. When doing
this evaluation, please judge each group’s Creativity, Usefulness, and Novelty relative to all the other groups.

PROCEDURE

1. To get an initial feel for relative Creativity, Usefulness, and Novelty, please read all of the solutions for at least the first 5 groups before doing any evaluations. Then, go back to Group 1, and evaluate all groups in terms of Creativity, Usefulness, and Novelty
2. Please do your evaluations in Group Number Order (evaluate Group 1, then Group 2, etc.).
3. Please do NOT talk to your colleagues about this exercise until after all of the evaluations have been returned.