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Information Sharing Under Mixed Cooperative and Competitive Reward Structures

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Abstract

With regard to the increased application of team-based organizational structures, great attention has been devoted to research on work groups. A growing body of literature indicates the crucial role of cooperative or competitive reward structures in determining information sharing patterns, and in turn group performance. The real situations are, however, a mixture of cooperative and competitive- coopetitive- reward structures in different intensities and mix. This study aims to provide a better understanding of coopetitive structures and their impact on group interactions. More specifically, this study investigates how two types of coopetitive reward structures (dominant cooperative and dominant competitive reward structures) are different in terms of determining the quality of information sharing among group members over time. Drawn upon the extant literature, a theoretical model of coopetitive reward structures is proposed. The model postulates that the relationship between coopetitive reward structures and high-quality information sharing is contingent upon task complexity and group dynamics. Laboratory experimental research is proposed as the research methodology. The details of the proposed research methodology including the experiment procedures, variables, and participants are discussed for validation and testing of the conceptual model.

Keywords

Information sharing, knowledge sharing, mixed rewards, cooperative and competitive reward, coopetition, coopetitive reward, group

INTRODUCTION

Reward structures are considered as flexible tools through which group members are motivated and resources are allocated (Ferrin and Dirks, 2003). Rewards are shown to directly or indirectly affect work-related outcomes such as group performance, job satisfaction, and interpersonal trust (Rosenbaum, 1980, Wageman and Baker, 1997, Ferrin and Dirks, 2003).

The extant literature draws attention to two typical reward structures, cooperative and competitive ones (Beersma et al., 2003). Majority of the studies have examined the relation between pure cooperative or competitive rewards and numerous outcome variables. This is despite the fact that beside a dominant climate, the real situations are and require a mixed reward structure (Tjosvold, 1998, Beersma et al., 2003, Johnson et al., 2006, Serrano and Pons, 2007). The extant literature points to the mixture of cooperative and competitive reward structures as one important but largely unexplored area for further research (Gordon et al., 2000).

Social interdependence theory suggests that the impact of cooperative and competitive reward structures on group performance is basically mediated by the information sharing among team members (Deutsch, 1949, Johnson et al., 2006, Pee et al., 2008). However, to our knowledge, there is no study that has examined the impact of simultaneous cooperative and competitive reward structures on the information sharing of team members, particularly over time.

In contrast to the rewards structures that are flexible means of motivation, changing individuals' communication behaviors can be expensive and can meet with mixed results. Hence, for practical as well as theoretical reasons,

it is important for organizational researchers to develop a fuller understanding about how changes in reward structures can potentially lead to better information sharing among individuals.

This study provides a detailed overview of cooperative, competitive, and mixed (coopetitive) reward structures in the extant literature. It then postulates a conceptual model that explains how two types of coopetitive rewards are different in determining the quality or effectiveness of the information being shared among individuals. A research methodology, which incorporates experimental research is proposed for testing and examining the postulated model.

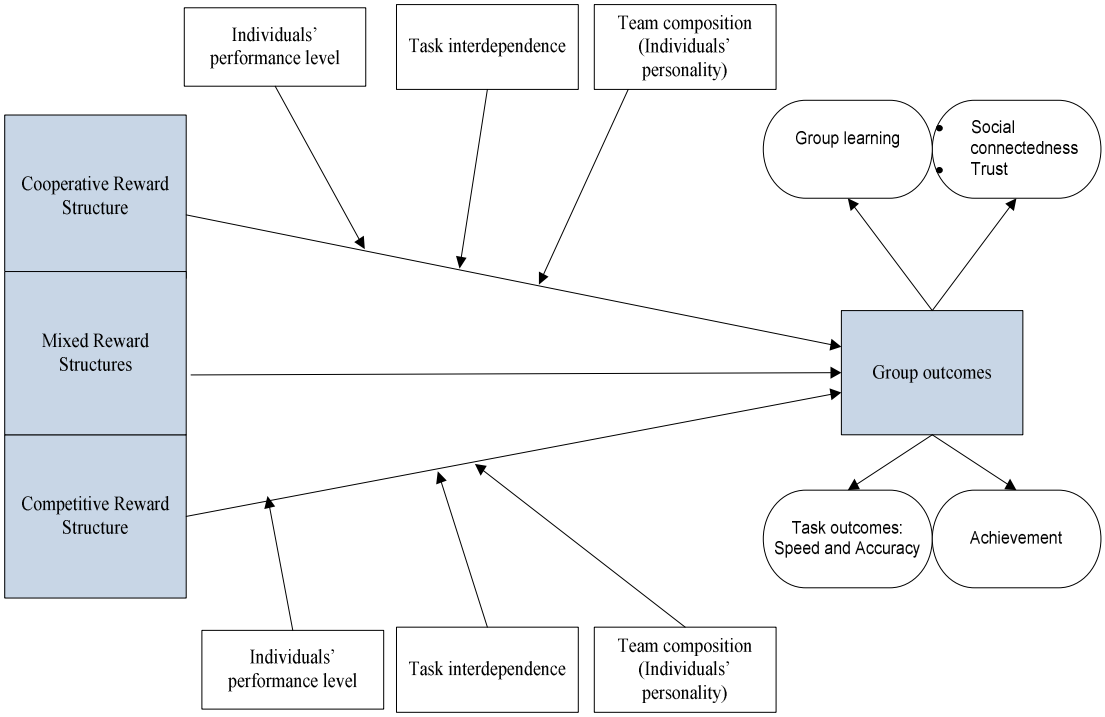
BACKGROUND OF COOPERATIVE, COMPETITIVE REWARD STRUCTURES

Team-based structures are increasingly being employed by organizations (Sundstrom et al., 1990, Garvey, 2002, Johnson et al., 2006, Beersma et al., 2009). Besides, longitudinal surveys of Fortune and 1000 organizations indicate that the use of team-based incentives in promoting group performance and coordination of efforts is on rise (Garvey, 2002). This has resulted in numerous studies that investigate how reward structures may support the increasing trend of team-based structures (Rosenbaum, 1980, Johnson et al., 2006).

Reward structures are defined as the basis upon which rewards are distributed among two or more individuals (Johnson and Johnson 1989, Cunningham, 2001). The extant literature draws attention to two typical reward structures, cooperative and competitive ones (Graziano et al., 1976, Slavin, 1980, Harris and Covington, 1993, Beersma et al., 2003). Cooperative rewards are solely based on joint performance. Since the common interest of individuals is in performing well, cooperative rewards provide an incentive for collaborative work (Johnson and Johnson 1989). Competitive rewards are based solely on the performance of one individual relative to another. In other words, individuals are rewarded for outperforming their partner (Johnson and Johnson 1989). Numerous studies have examined and compared the relationship between cooperative or competitive reward structures and group outcomes such as task speed, task accuracy, group achievement, social connectedness, and interpersonal trust (Slavin, 1977, Beersma et al., 2003, Ferrin and Dirks, 2003, Johnson et al., 2006, Serrano and Pons, 2007, Beersma et al., 2009).

Over years, several studies have shown that the relationship between reward structures and their social outcomes is more complex than what previous researchers have thought (Gordon et al., 2000). These studies have highlighted that the above relationship is contingent upon several factors such as task interdependence, task dimension, team composition, and individuals' performance levels (Miller and Hamblin, 1963, Johnson et al., 2006). It should be noted that these factors have been identified over years. This explains the reason that some studies stress the positive impact of cooperative rewards on group outcomes in comparison to competitive rewards and some others have observed the opposite relationship (Slavin, 1977, Slavin, 1980). For example, Wageman and Baker (1997) demonstrated that cooperative reward interdependence leads to superior team performance in extremely high or low task interdependence environments (Wageman and Baker, 1997). However, when task environment is moderately interdependent, a less cooperative reward system results in higher team performance (Derue and Hollenbeck, 2007). In another example, it was shown that under task interdependent conditions, the greater competitive rewards had more negative impacts on group performance, whereas under task independent conditions no such relationship was observed. Bettencourt et al. (1992) empirically showed that inter-group competition directed individuals toward the group task and achievement, whereas inter-group cooperation encouraged more interpersonal interactions and social connectedness (Bettencourt et al., 1992). Beersma et al. (2003) draw attention into two group task performance dimensions (task speed, task accuracy) and their different antecedents. These scholars argue that the simple notion that collaborative rewards structures are suitable for enhancing all aspects of the performance of interdependent teams is not true. Furthermore, Beersma et al. (2003) conclude that extroverted and agreeable team members often perform better under cooperative structures, whereas teams low on these orientations perform better under competitive structures. Figure 1 summarizes an overview of the literature on the relationship between cooperative and/or competitive reward structures and group outcomes such as: achievement, speed, accuracy, group learning, trust, and social connectedness.

Majority of the studies have investigated the relation between pure or extreme cooperative and competitive conditions and outcome variables, despite the fact that although there is a dominant climate, the real situations are and require a mixed structure at various intensities (Tjosvold, 1998, Beersma et al., 2003, Johnson et al., 2006, Serrano and Pons, 2007). The extant literature points to the mixture of cooperative and competitive reward structures as one important but largely unexplored area for further research (Gordon et al., 2000). This lack of research could be partly related to the Deutsch's view arguing that hybrid structures are a weaker and more unstable version of more strong cooperative or competitive structures, and so do not require independent research (Gordon et al., 2000). The next section draws upon the extant literature to propose a model for reward structures and information sharing.



Major examples: Deutch (1949) * Miller and Hamblin (1963) * Slavin (1977) * Rosenbaum (1980) * Johnson and Johnson (1989) * Bettencourt et al. (1992) * Wageman and Baker (1997) * Gordon et al. (2000) * Beersma et al. (2003) * Ferrin and Dirks (2003) * Johnson et al. (2006) * Derue and Hollenbeck (2007)

Figure 1: Reward Structures and Group Outcomes

MIXED REWARDS

Cooperative rewards are given based on the performance of the group, and are equally divided between the group members. Competitive rewards are generally given based on the performance of the one who has made the most contribution to the performance. The prior studies have created mixed rewards in two ways including (i) An average of cooperative (group-rewarded) and competitive (individualistic) rewards (Rosenbaum, 1980, Ferrin and Dirks, 2003) and (ii) cooperative-individualistic hybrid (moderate cooperative condition) and zero sum (moderate competitive condition) (Wageman and Baker, 1997, Gordon et al., 2000). Similarly, in an effort to create a cooperative reward structure, Serrano and Pons (2007) designed experiments in a university context in which 70% of the grade of each team member was based on the mean of other team members' grades and 30% was based on their individual grades. This refers to the second way discussed above, and is in alignment with the viewpoint that real situations are a mixed reward structure with a dominant climate of cooperativeness or competitiveness (Tjosvold, 1998, Beersma et al., 2003, Ghobadi and Daneshgar, 2010). Therefore, this study refers to two types of the mixed reward structures. The first type is the one with a dominant cooperative structure (type 1: dominant cooperative structure), and the second type is the one with a dominant competitive structure (type 2: dominant competitive structure). In this research, dominant cooperative structures include 70% cooperative and 30% competitive rewards. Dominant competitive structures reward structures include 70% competitive and 30% cooperative rewards.

Cooperative, Competitive Reward Structures and Information Sharing

Social interdependence theory suggests that the impact of pure cooperative and competitive reward structures on group performance is basically mediated by the information sharing among team members (Deutsch, 1949, Johnson et al., 2006, Pee et al., 2008). Furthermore, reward structures may influence individuals' behavior, which they may then use as a source of information for inferring their level of trust in the partner (Ferrin and Dirks, 2003). This viewpoint is also supported by another line of research, in which proper information sharing is regarded as a coordination behavior, which promote group productivity (Steiner, 1972, Lin, 2007).

Cooperative reward structures are expected to motivate individuals to engage in cooperative behaviors such as sharing information completely and accurately because doing so is key to joint success and, hence, the acquisition of rewards (Lucker et al., 1976, Brandenburger and Nalebuff, 1998, Johnson and Johnson, 1998, Beersma et al., 2003).As a result, cooperative reward structures are believed to increase learning by allowing

people to pool their knowledge and produce more fruitful ideas and better understanding of the nature of their tasks (Goldman et al., 1977). The latter process refer to the exchange of the high-quality knowledge, which fulfils the needs of group members (Von Hippel, 1994, Li and Hsieh, 2009). In contrast, competitive rewards motivate individuals to engage in an opposite set of behaviors such as withholding information and sharing information inaccurately because withholding important information maximizes individual's performance at expense of his/her partner (Lucker et al., 1976, Brandenburger and Nalebuff, 1998, Johnson and Johnson, 1998, Beersma et al., 2003).

According to the above discussions, our first hypothesis asserts that dominant cooperative reward structures increases the quality of information being shared compared to those with a dominant competitive reward structure.

Hypothesis1: The quality of the information being shared is higher under dominant cooperative reward structures than dominant competitive reward structures.

Task Complexity

According to Wood (1986), all tasks contain three essential building components including: (i) products, (ii) required acts, and (iii) information cues. The major difference between simple and complex tasks may be the result of the differing number of cues that must be processed and the number and the complexity of the individual processes required (Wood, 1986, Speier et al., 2003). Accordingly, simple tasks require processing fewer cues (pieces of data), whereas complex tasks (where the cues are typically interrelated) require significantly more processing of information cues, to be able to find creative methods for accomplishing tasks.

Since the formulation of social interdependence theory, many studies have sought to determine how to match reward structures with various types of tasks. For example, it has been indicated that cooperative reward structures are superior for promoting group performance and information sharing when the means interdependence of a task is high (Wageman and Baker, 1997). Some studies have applied this theory to explain differences in the accuracy and speed achieved with cooperative and competitive reward structures (Beersma et al., 2003, Johnson et al., 2006).

Complex tasks generally require more creativity and innovation compared to simple tasks, and this can occur by more effective information sharing. Cooperative rewards are suggested to promote information sharing. Therefore, complex tasks require cooperative rewards more than simple tasks. In other words, the positive impacts of cooperative rewards on high-quality knowledge sharing would be more in complex tasks compared to simple tasks. Therefore, it can be expected that the difference between the quality of the information being shared in cooperative and competitive structures is more when the task is complex. This constitutes our second hypothesis asserting that:

Hypothesis2: The difference mentioned in Hypothesis 1 is higher under complex tasks than simple tasks

Past History of Working Together

There is an emerging conceptual consensus, which views teams as complex, adaptive, and dynamic systems that perform over time (Mcgrath et al., 2000, Johnson et al., 2006). This new conceptualization has led to new insights on the concept of group's past history and its impact on group processes and outcomes (Harrison et al., 2002, Johnson et al., 2006).

For instance, Structural Adaptation Theory (SAT) has been developed to understand and explain how teams react to changes in reward structures: cooperative to competitive and vice versa (Johnson et al., 2006). SAT introduced two concepts including: cutthroat cooperation and friendly competition to explain how teams react to changes in cooperative or competitive reward structures. More specifically, Johnson et al (2006) empirically showed that cooperative reward structures lead to establishing positive relationships and norms of behaviour that allow an easier shift to competitive reward structures. Similarly, Tjosvold et al. (2003) showed that "friends with a history of working together cooperatively may behave quite differently in a competition than would participants who dislike each other and have engaged in negative behaviors toward each other in the past" ((Tjosvold et al., 2003): 68). The latter study found that having positive feelings during the competition and perceiving that competition enhances task effectiveness increases the motivation to collaborate with competitors in the future. In the following, Johnson et al. (2006) proposed the concept of friendly competition- shifting from cooperative to competitive reward structures. Accordingly, the past cooperative experience in these teams allows them engage in competition with each other- increasing their speed but decreasing their accuracy. Similarly, the concept of cutthroat cooperation was explained by Johnson et al. (2006). Johnson et al. argued that the benefits associated with cooperative reward structures will be less forthcoming in groups that have a past history of competition. Accordingly, teams that switch from competitive to cooperative reward structures experience

"cutthroat cooperation". Cutthroat cooperation results in lower information sharing, lower team decision accuracy, and higher speed that resemble competitive teams more than cooperative teams.

In summary, the concept of group's past history makes team members react in a way that affect others as well as the group performance. As a result, having the past history of cooperation encourages teams to have more collaborative communication with each other. Whereas, having a previous competitive experience increases the feeling of competition in the similar situations. Therefore, this study proposes that the difference discussed in Hypothesis 1 is higher when a group has previously worked under a similar reward structure.

Hypothesis3: The difference mentioned in Hypothesis 1 is higher when group have a history of working under a similar reward structure.

The above idea has similarities with the extant literature on the game theory that explains players make choices that potentially influence other players' interests. Game theory constitutes of prisoner's dilemma, which is a strategic game between two players that each of them has two choices: cooperate or defeat. Information sharing among competitors is a common type of coopetition (Tsai, 2002). The intention to share information could be viewed from this dilemma (Loebecke et al., 1999). In this viewpoint, the value of information is consisted of two parts. One is the basic value of information (r) and the other is value-added (v) that reflects the advantage of receiving information by the receiver while the sender is not aware that is lost by sharing. Therefore, a concept called payoff, which represents the desirability of an outcome, can be measured to demonstrate the value people get and loose in a game. However, the importance and value of information might impede information sharing between players where people prefer to hoard information and get payoffs. This dilemma is called employee's dilemma. In order to facilitate information sharing under strategic games, research suggests different factors including: creating long-term commitments, focusing on trust, reciprocity and longevity, incentives and reward structures, and shaping small team sizes with good relationships (Shih et al., 2006). This study believes that team members share their information on the basis of their past experience of information sharing. For example, if they found information sharing with other team members effective in reaching their outcomes, they will continue sharing information in future works too. This study adopts the concept of 'information sharing satisfaction' (Willem and Buelens, 2009) to explain group's past history and its impact on future information sharing. Therefore:

Hypothesis4: The quality of Information being shared among group members is affected by their past experience of information sharing and their perception of the effectiveness of information sharing in order to be awarded the determined rewards.

Taken the proposed hypotheses together, Figure 2 illustrates the proposed model of this study.

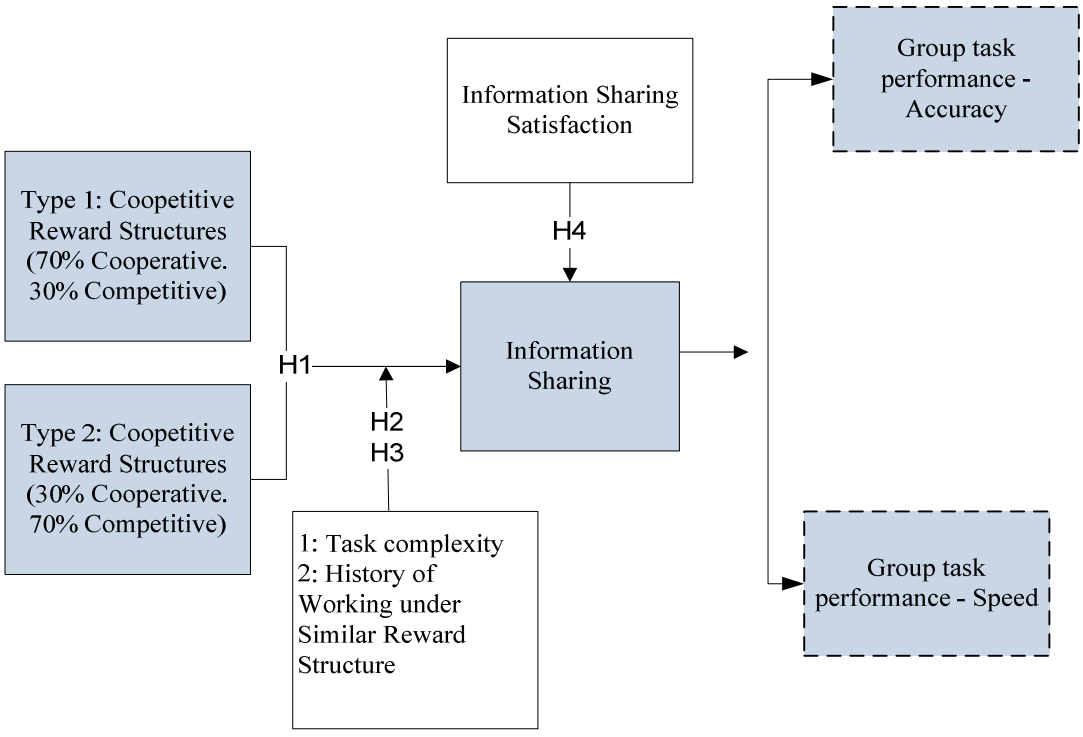


Figure 2: Proposed Model

METHODS

The proposed research strategy involves a laboratory experiment utilizing a 2*2 factorial design. Laboratory research experiment is suggested because this methodology is in alignment with the previous studies in this domain (e.g., (Gordon et al., 2000, Ferrin and Dirks, 2003, Beersma et al., 2009)), and it also allows us examine specific observatory relationships in the model and draw conclusions about causality.

The factors are R2 (dominant cooperative reward/dominant competitive rewards) and T2 (complex task, simple task). The dependent variables are 'high-quality information sharing' and 'information sharing satisfaction'. Table1 provides an overview of the experimental variables. Group personality, age, and gender are the co-variance factors.

Table 1. Research Design

Independent variable Variable	Dependent variable	Co variances
1. Reward Structure: (i) Dominant cooperative rewards (ii) Dominant competitive rewards 2. Task Complexity: (i) Simple task (ii) Complex task	1. High-Quality Information Sharing 2. Information Sharing Satisfaction	1. Personality 2. Age 3. Gender

Experiment Task

The experiment involves solving a design problem in a dyad relationship. The task is intended to be representative of project team work where team members are assigned a functional discipline and work together to solve a design problem. Joint problem-solving activities are central to many organizational phenomena and theories (e.g., participative leadership, negotiation, decision making). Individuals engaged in joint problem solving are interdependent because they must share and integrate information. However, they are also at the risk because as one partner contributes information and efforts to the problem solving task, but another partner may not reciprocate.

Each dyad will be randomly assigned to only a single cell of the experimental design:

1. Simple Task & Dominant Cooperative Rewards
2. Simple Task & Dominant Competitive Rewards
3. Complex Task & Dominant Cooperative Rewards
4. Complex Task & Dominant Competitive Rewards

Experiments will be conducted in two rounds with 15 minutes break between. Each round of the experiments will take half an hour. Each round of experiment includes one task that should be completed at the end of that round and is similar to the task in the other round of the experiment in terms of the complexity. During the break, participants will be kept within the lab and could surf the internet. This will be also guaranteed that they won't know the identity of their peers. The proposed communication system is the Blackboard system.

To create simple and complex tasks, this study refers to the major differences between simple and complex tasks that are the number of cues that must be processed and the number and the complexity of the individual processes required (Wood, 1986, Speier et al., 2003). Four tasks will be designed representing simple and complex tasks. Two of the tasks that represent simple tasks include Html coding (one for the first round and one for the second round). Two of the tasks represent complex tasks and include Java coding (one for the first round and one for the second round). The order of the tasks for each dyad would be random. We deliberately manipulate 5 errors in the Html codes, and 10 errors in the Java codes. Based on the assigned task (Html or Java), students will be told that there are 5 or 10 errors that they need to solve.

Participants

64 students with reasonable knowledge on Html and Java programming will be selected. They will be told that experiment is an Html or Java coding task that takes not more than 1.5 hours, and they will be paid based on their performance in the task. Since there are 4 conditions (cells) and 64 students, 8 dyads will exist per condition (16 students per condition).

Rewards

Reward structure type 1 includes 70% cooperative and 30% competitive rewards. Reward structure type 2 includes 70% competitive and 30% cooperative rewards. Students will be advised of the reward system and the incentives that they could be given based on their performance.

Based on the calculation in this study, the proposed method is a point system. For example, under the condition 'Cooperative / Html, if they solve 3 errors out of 5 errors, the group can be given 27.3 points that will be equally divided into two, and the one who solved more errors (e.g., one dyad solved 2 errors and the other solve 1 error) will be given 19.5 points. If they both solved same numbers of errors, 19.5 points will be divided between them. After each round, the group announces how many errors each individual solved. In the case of conflicts, a third-party researcher will check the archive of their communication, and will resolve the situation. The final decision is based on the opinion of the third party.

Experiment Procedure

Before the first round of the experiment, students will be asked a few questions including: sex, gender, personality (introverted, extroverted), their score in programming (Html or Java), and questions for manipulation checks that aim to ensure the efforts in creating two types of tasks and two types of reward structures have been successful.

After the completion of the first round, students will be asked a few questions that measure 'high-quality information sharing' in the first round. The rewarded points will be estimated. Students will be advised of the group and individual points (both for themselves and for their peers).

After the break, students will be asked questions measuring 'information sharing satisfaction'.

After the completion of the second round, students will be asked a few questions that measure 'high-quality information sharing' in the second round. Based on their performance in the two rounds, their total points will be estimated, and they will be paid respectively.

Data Analysis

There will be 8 dyads for 4 conditions (8*4*2=64 students), which is adequate for non-parametric tests. A comparison (non-parametric test) of the GPA of dyads and their score in their programming course will be checked.

The following analysis is based on the mean of the responses that is provides by each dyad. A two-way cross tabulation of participants' responses to manipulation check questions are required to check validity and reliability of our effort in simulating (simple task/complex tasks) & (cooperative rewards / competitive rewards). Chi-square analysis of responses to the manipulation check questions should be examined in order to confirm significant difference among these conditions.

For the analysis measurement and structural models, Amos will be used to check confirmatory factor analysis, convergent and discriminant validities, interaction hypothesis, and moderating effect.

CONCLUSION

This study postulated a model that explains how mixed coopetitive reward structures are different in terms of determining the quality of information sharing among group members over time. The proposed model postulates the relationship between two types of coopetitive reward structures (dominant cooperative & dominant competitive) and high-quality information sharing, and how this relationship is contingent upon task complexity and group dynamics. Laboratory experiments are the proposed research methodology, and the details of the research process including the proposed tasks, rewards, participants, experiment procedure, and data analysis techniques are discussed. The research is in progress in terms of conducting the experiments and examining the model's hypotheses.

This study has a number of limitations that must be addressed. Firstly, while the choice of students as the participants is a common method of conducting experiments, it has its own limitations compared to the employment of experienced practitioners that better represent real-world situations.

Secondly, whilst the choice of Html and Java coding tasks is acceptable, this choice does not fully represent all types of simple and complex tasks.

Thirdly, there are a number of additional factors that can be included in the expanded versions of the proposed conceptual model. For example, temporal factors (e.g., task duration) presumably play a role in the relationship

between rewards and information sharing. For example, simple tasks that need to be accomplished quickly may result in greater cooperation than simple tasks that can be done at a slower pace. However, we do not include them in the model of this paper. This is because the focus of this study is the comparison of the impact of dominant cooperative and competitive rewards on high-quality information sharing (the gap in the literature), rather than the impact of additional factors on the relationship between one type of rewards and information sharing.

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