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Incentivizing Creativity in Virtual Groups

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Short Paper

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Abstract

Creativity is the key element of organizational success. Yet, adequately incentivizing people to be creative remains a problem without uniform solution. This study investigates the effect of incentive systems that rely on supervisor discretion on creativity of virtual groups. Adopting Social Interdependence Theory, we experimentally assess the effect of forced distribution rating systems (FDRS) and unrestricted distribution rating systems (UDRS) on idea generation and idea selection of groups collaborating in a virtual setting. We show that the competitive FDRSs – in which not every group member can obtain a top ranking - enhance idea generation, idea selection and overall creativity of virtual groups. We contribute to the literatures on creativity, virtual collaboration and incentive systems.

Keywords: Virtual collaboration, group creativity, incentive systems, supervisor discretion, forced distribution

Introduction

Employee creativity – defined as the generation of ideas that are both, novel and useful (Amabile 1983) – is crucial for firms to facilitate innovation (Zhou and Hoever 2014), competitiveness (Li et al. 2017) and long-term success (Sacramento et al. 2013). While creativity is certainly a function of individual characteristics (Shalley et al. 2004), scholars have found that organization level factors equally influence employee creativity (Oldham and Cummings 1996). Among those, the design of appropriate incentive systems is of special importance (Burroughs et al. 2011; Eisenberger and Rhoades 2001; Kachelmeier et al. 2008).

However, there is uncertainty about which types of incentive systems foster and which types inhibit creativity (Amabile 1996; Burroughs et al. 2011). Incentive systems that aim at fostering individuals' creativity in independent tasks require different structures than incentive systems for group tasks in which group members must collaborate in a virtual setting to increase the group's overall creativity (Gong et al. 2013). Phrased differently, designing an incentive system for a creative group task is complex, as it must address the relative individual creativity of each member and their relative cooperation efforts. Usually, when rewarding employees for their performances in group tasks or in tasks without clearly defined performance criteria, organizations adopt supervisor ratings to determine the rewards (Pearce and Xu 2012). Supervisors can observe the quality of the group output, as well as the individuals' inputs to the solution and intra-group behaviors. Forced distribution rating systems (FDRS) are the most prevalent incentive systems relying on supervisor discretion. Twenty percent of the Fortune 500 companies adopt FDRSs to incentivize their employees (Grote 2005). These include companies like Amazon that employ FDRSs to motivate their creative teams to develop new products at a high frequency (Kantor and Streitfeld 2015). However, there is little guidance on the effect of FDRSs on the creative performances of virtual groups.

The aim of this study is to assess how the creativity of virtual groups (i.e., groups collaborating in a virtual setting) is affected by incentive systems that are based on supervisor ratings. There are two design options for incentive systems that are based on supervisor evaluations: unrestricted distribution rating systems (UDRS) and forced distribution rating systems (FDRS) (Loberg et al. 2021). In unrestricted distribution rating systems, supervisors can allocate rewards to their employees at their own discretion. There are no organizational restrictions on how a reward pool has to be distributed. In forced distribution rating systems, organizations predetermine a distribution of relative performance categories that are tied to rewards according to which supervisors must rate their employees (Giumetti et al. 2015). FDRSs have been consistently used for decades since they force supervisors to more carefully differentiate between the performances of their employees (Kwoh 2012). FDRSs counteract typical rating biases of UDRSs, such as rating all employees in the top categories (i.e., leniency bias) or rating all employees similarly (i.e., centrality bias), which is believed to increase rating accuracy (Scullen et al. 2005).

Based on Social Interdependence Theory (SIT) (Deutsch 1949; Johnson et al. 2006; Johnson and Johnson 1989), we hypothesize that incentive systems with predetermined performance distributions, such as FDRSs, decrease creativity of virtual groups. The SIT argues that the behaviors of individuals in a group depend on the correlation of their goals (Johnson and Johnson 1989). FDRSs represent highly competitive incentive systems (Moon et al. 2016) in which group members perceive their goals to be negatively correlated. Consequently, group members behave less collaboratively, which in turn impedes creativity (Baer et al. 2010; Gong et al. 2013; Taggar 2002). Extending prior work, we address the mechanisms through which incentive systems affect creativity of groups: idea generation and idea selection. Idea generation and idea selection represent the two sub-activities or stages needed to achieve a common solution to a problem or task (Chen et al. 2012; Goncalo and Staw 2006; Keum and See 2017). We hypothesize that FDRSs have a positive effect on the idea generation of groups, since they motivate employees to invest high effort into individually generating a high number of well-elaborated ideas. On the other side, we hypothesize that FDRSs have a negative effect on the idea selection. FDRSs motivate employees to force the selection of their own ideas instead of the selection of the idea that is the most creative. The negative effect on the latter outweighs the positive effect on the former, leading to a negative overall effect of FDRSs on group creativity. To assess the causal nature of our predictions, we test our

hypotheses on 25 virtual groups[1] in an experiment with a between-group design, randomly assigning the groups into two treatments: FDRS and UDRS.

Our research contributes to the creativity, virtual collaboration and incentive systems literatures in multiple ways. We compare the influences of two incentive systems, FDRS and UDRS, that are based on evaluations of a supervisor on creativity of virtual groups. So far, the effectiveness of FDRSs and UDRSs has only been investigated for general productivity of in-person groups, but not for creativity of groups collaborating in a virtual setting (Berger et al. 2013; Loberg et al. 2021). Creativity scholars have primarily focused on creativity of groups under diverse objective incentive schemes, in which creativity is assessed along clearly defined measures by actors external to the group (Baer et al. 2010; Chen et al. 2012; Shalley et al. 2004). These objective incentive systems reward the creativity of the group solution and fail to include individual effort and intra-group behaviors into the assessment of creativity (Demeré et al. 2019). We focus on incentivizing creativity in virtual groups as there is an increasing interest in virtual collaboration caused by the Covid-19 pandemic and the resulting high levels of remote work (Brucks and Levav 2022; Chamakiotis et al. 2021). Nevertheless, there is still only a limited amount of research on how virtual collaboration is affected by incentives (Baer et al. 2014). We adopt the SIT to assess creativity of virtual groups under the different reward scenarios. While most studies on the effects of incentive systems on creativity build on psychological aspects that influence individual creativity (Erat and Gneezy 2016; Li et al. 2017), we highlight the importance of group members' goal interdependence for group creativity (Johnson et al. 2006). This is important because intra-group behaviors such as cooperation and knowledge sharing, that are associated with higher creativity, substantially depend on goal interdependence (Baer et al. 2010; Taggar 2002).

Theoretical Background

Group creativity is a two-stage process at whose end a group defines one idea as their output (Goncalo and Staw 2006). We separately investigate, how the presence of FDRSs, compared to UDRSs, affects the idea generation and the idea selection of virtual groups. Since the tasks and the objectives of the two stages differ substantially (Chen et al. 2012), FDRSs and UDRSs evoke different behaviors in each of the stages.

FDRSs induce competition into the group (Johnson et al. 2006). The induced competition motivates the individual group members to act in a way that promotes their relative standing compared to the other group members in the eyes of the supervisor (Schuh et al. 2018). The pressure to outperform group members severely biases the idea selection process. The negative influence of FDRSs on the idea selection outweighs the influences (positive or negative) that FDRSs have on the idea generation process. Thus, we hypothesize:

H1: In virtual collaborations, FDRSs decrease the creative performances of groups.

In the idea generation phase of a creative group task, the induced competition by the FDRS motivates the individual group members to generate a high amount of well-elaborated ideas to signal high effort and capability to the supervisor (Kampkötter and Sliwka 2018). The performance of the group, in terms of productivity, benefits from the increased individual efforts, as a large number of ideas that at are deliberately formulated are generated without decreasing the average creative quality of the ideas (Kachelmeier et al. 2008; Rietzschel et al. 2006). We derive the following hypothesis:

H2: In virtual collaborations, FDRSs increase the productivity in a creative group task.

In the idea selection phase, the competitive incentive system leads to a social dilemma (Dawes 1980). The objective of the group, to select the most creative idea, and the objective of the individuals, to have their own idea selected, are opposed to each other (Barnes et al. 2011). The increased level of competition induced by the FDRS leads to the employees assigning higher value to their individual goals than to the group objective. Despite knowing that the own idea might not actually be the most creative idea, each employee tries to convince their group members that the own idea should be selected as final group idea (Swab and Johnson 2019). The decision quality of the group decreases (Barnes et al. 2011). Therefore, we derive the following hypothesis:

H3: In virtual collaborations, FDRSs decrease the idea selection quality in a creative group task.

[1] At the time of submission, we conducted two of three experimental waves (i.e., with 25 of targeted 40 groups).

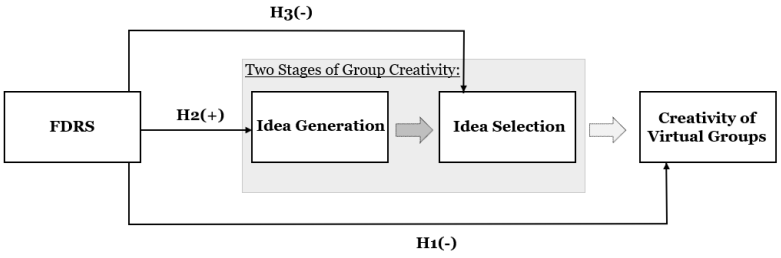

Figure 1. Structural Equation Model of our Hypotheses

Methods

Experiment

We test our hypotheses in a virtual experiment adopting a student sample. The use of student samples is common in experiments related to group creativity, incentive systems and virtual collaboration, as the behaviors of student groups and their reactions to incentives are transferrable to those in organizational settings (Altschuller and Benbunan-Fich 2013; Baer et al. 2014; Paulus and Yang 2000). In a between-group design, we employ two treatment conditions: FDRS and UDRS. The experiment is currently under way via a video communication tool (i.e., Zoom) which enables vocal communication and face-to-face interaction. In the two (out of three) experimental waves that have been conducted to this point, 100 students in 25 groups have participated in the experiment. The average age is 23.9 years and 40 percent of the participants are male.

In the experiment, participants are randomly assigned to groups of four. One participant is assigned the role of the supervisor, the other participants are appointed as employees. The groups receive the task to develop creative ideas on how to use an empty building that is located on the campus of their university. The task is an adapted version of the task used in the study by Keum and See (2017). The solution process is structured in two 15-minute phases: an idea generation phase and an idea selection phase (Rietzschel et al. 2006). In the idea generation phase, the participants that occupy the role of employees are asked to generate as many ideas as possible to solve the task. Afterwards, in the idea selection phase, the employees must select one of their generated ideas as group idea. The supervisor passively observes the behavior of their employees during the two phases. After the idea selection phase, the supervisor must allocate 45 Euro to their employees. In the FDRS treatment, the supervisor must allocate the 45 Euro to the employees following a $\frac{2}{3}$ / $\frac{1}{3}$ / 0 – distribution. In the UDRS treatment, the supervisor is free to distribute the bonus pool amongst their employees at their own discretion. In both treatments, the supervisor is allowed to use all available information for the evaluation of their employees' performances. The supervisor is rewarded based on the creativity of the selected idea of their group. In addition to the performance-based reward, each participant receives a show-up fee of 5 Euro. We ensure that all participants have comprehended their incentivization by asking a set of control questions before the beginning of the idea generation phase.

Measures

In the idea generation phase, we employ productivity as our main dependent variable (Kachelmeier et al. 2008). Productivity is the product of the number of ideas and the number of words per idea. Further, novelty and usefulness of all generated ideas are evaluated by three external raters, following Amabile's (1983) consensual assessment technique. Based on the evaluations by the raters, we constructed average scores for each idea. The intraclass correlation coefficients and the interrater agreement scores justify the aggregation to average scores (novelty: $r_{wg[3]}$=.65, ICC[2,1]=.51, ICC[2,3]=.76; usefulness: $r_{wg[3]}$=.55, ICC[2,1]=.19, ICC[2,3]=.41) (Bliese 2000). The product of the average novelty and average usefulness scores portrays the creativity score for each idea (Hoever et al. 2012). The creativity score of the idea that has been selected in the idea selection phase represents the main measure for group creativity. Additionally, we divide the creativity rating of the selected idea by the average creativity of a group's ideas from the idea generation phase to measure idea selection quality. Via post-experimental questionnaires, we further collect data on perceived cooperation, competition and task interdependence in the two phases (Gong et al. 2013;

Wong et al. 2005). The measures for cooperation and competition represent approximations of the goal interdependence of group members.

Results

Manipulation Checks

After each of the two phases, the participants in the role of employees rate the perceived level of cooperation and competition in their group on 7-point likert-scales. We analyze the effectiveness of our manipulations using mean comparison tests. The results (see Table 1) show that in the idea selection phase, the FDRS evokes a higher level of competition ($t(72)=1.87$, $p<0.05$) and a lower level of cooperation ($t(72)=-1.56$, $p<0.1$) compared to the UDRS. In other words, FDRSs are associated with a more negative correlation of group members' goals. In the idea generation phase, we fail to report a significant effect of the FDRS on perceived cooperation ($t(72)=-0.36$, $p=0.35$) and competition ($t(72)=1.06$, $p=0.15$). Nevertheless, the manipulation checks report the same tendencies as for the idea selection phase: FDRSs evoke competition and harm cooperation.

Comparing the effects of the treatments in the two phases, we find that in the FDRS treatment the perceived level of competition is significantly higher in the idea generation phase than in the idea selection phase ($t(88)=1.38$, $p<0.1$). This result contradicts our intended manipulation that the FDRS would lead to a more negative correlation of goals in the idea selection phase than in the idea generation phase.

Task interdependence is significantly higher in the idea selection phase than in the idea generation phase ($t(146)=3.11$, $p<0.01$). Thus, the idea selection is perceived more as a group task than the idea generation.

	Idea Generation phase		Idea Selection Phase	
	Cooperation	Competition	Cooperation	Competition
FDRS	Mean = 5.26 SD = 1.11	Mean = 3.34 SD = 1.46	Mean = 5.63 SD = 1.05	Mean = 2.91 SD = 1.33
UDRS	Mean = 5.35 SD = 1.07	Mean = 2.99 SD = 1.09	Mean = 5.99 SD = 0.84	Mean = 2.34 SD = 1.24
Notes. SD:= Standard Deviation.				

Table 1. Manipulation Checks

Hypothesis Tests

Table 2 illustrates the descriptive statistics of the variables in our experiment. We report the means for the variables of interest across the FDRS and UDRS treatments. Row (1) to (4) concern the idea generation, row (5) the idea selection and row (6) the overall creativity of the groups. In the last column we present the p-values of the two-sided ttests on whether the means in the respective treatments are statistically unequal. Table 2 shows a significant difference for the means of *Usefulness* and *Creativity* across treatments.

	Overall	FDRS	UDRS	Ttest (FDRS != UDRS)
Number of Observations[3]	25	15	10	
(1) Productivity	54.48 [30.46]	62.27 [33.61]	42.80 [21.53]	p = 0.119
(2) Novelty	4.64 [0.77]	4.70 [0.81]	4.56 [0.73]	p = 0.656
(3) Usefulness	5.07 [0.40]	5.21 [0.36]	4.86 [0.38]	p = 0.031
(4) Creativity	23.57 [4.36]	24.76 [4.29]	21.78 [4.03]	p = 0.094
(5) Idea Selection Quality	1.37 [0.53]	1.48 [0.50]	1.21 [0.57]	p = 0.234
(6) Creativity Selected Idea	32.39 [13.49]	36.02 [11.96]	26.94 [14.42]	p = 0.100
Notes. Standard deviations are illustrated in brackets.				

Table 2. Descriptive Statistics

[3] The uneven number of groups in the treatments results from participants skipping experimental sessions.

We test our hypotheses using OLS regression. We employ the incentive treatment (FDRS vs. UDRS) as dummy variable that equals 1 in the FDRS treatment and 0 in the UDRS treatment. We control for the following demographic characteristics: average age of the group members, gender ratio of the group and whether at least two of the employees in a group have known each other before the experiment.

Hypothesis 1 addresses the overall creativity of groups in a creative task. It states that the creativity of the selected idea should be lower in the FDRS treatment than in the UDRS treatment. Table 3 shows that our results do not provide statistical support for our hypothesized relationship. We find that there is a significant effect of FDRSs on group creativity, but in the opposite direction than hypothesis 1 predicts. The creativity of the selected idea is higher in the FDRS treatment than in the UDRS treatment (p=0.022).

	Creativity Selected Idea		Idea Selection Quality	
	(1)	(2)	(3)	(4)
FDRS	9.070 [5.298]	11.953* [4.827]	0.264 [0.216]	0.353^{+} [0.201]
Ratio of Women		-25.156** [8.475]		-1.014** [0.353]
Average Group Age		-1.770 [1.186]		-0.156 [0.049]
Employees Know Each Other		-14.121 [12.196]		-0.460 [0.508]
Constant	26.944**	84.748*	1.211**	2.210^{+}
N	25	25	25	25
R^2	0.113	0.469	0.061	0.414

Notes. Standard errors are illustrated in brackets. FDRS and Employees Know Each Other are dummy coded. $^{+}$ p < 0.10; * p < 0.05; ** p < 0.01.

Table 3. Effects of FDRS on Overall Creativity and Idea Selection Quality

Hypothesis 2 addresses the effect of FDRSs on the idea generation of groups. Our results support hypothesis 2. Groups in the FDRS treatment are significantly more productive in the idea generation phase than groups in the UDRS treatment (p=0.017), when controlling for demographic differences in group composition (see Table 4). Further the average creativity of the ideas of groups under FDRSs is significantly higher than the average creativity of groups under UDRSs (p=0.059). While both factors that build the creativity score, i.e., novelty and usefulness, are higher under FDRSs compared to UDRSs (see Table 2), we only find a significant positive effect of FDRSs on the usefulness of the generated ideas (p=0.066).

	Productivity		Novelty		Usefulness		Creativity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FDRS	19.467 [12.035]	31.869* [12.183]	0.145 [0.320]	0.185 [0.333]	0.345* [0.150]	0.323^{+} [0.166]	2.984^{+} [1.709]	3.266^{+} [1.629]
Ratio of Women		-27.945 [21.390]		-0.267 [0.584]		0.222 [0.291]		-0.759 [2.861]
Average Group Age		-4.074 [2.992]		-0.174* [0.082]		-0.053 [0.041]		-1.221** [0.400]
Employees Know Each Other		61.798^{+} [30.779]		-1.117 [0.841]		-0.316 [0.419]		-6.516 [4.116]
Constant	42.800**	149.423^{+}	4.557**	8.959**	4.861**	6.015**	21.776**	51.914**
N	25	25	25	25	25	25	25	25
R^2	0.102	0.336	0.009	0.228	0.187	0.287	0.117	0.421

Notes. Standard errors are illustrated in brackets. FDRS and Employees Know Each Other are dummy coded. $^{+}$ p < 0.10; * p < 0.05; ** p < 0.01.

Table 4. Effects of FDRS on Idea Generation

Hypothesis 3 concerns the idea selection quality in creative group tasks. As illustrated in Table 3, we find a significant effect of FDRSs on the quality of idea selection. However, contrary to our hypothesis, the idea selection quality of groups in the FDRS treatment is significantly higher than the idea selection quality in the UDRS treatment. Thus, the results do not support hypothesis 3.

At the time of submission only two of three experimental waves (25 out of 40 groups) have been conducted. Hence, we are unable to report the final results at this point. We are confident that we will be able to present the final results of our experiment at the conference in December, if accepted.

Contribution

Our paper extends current research on the effectiveness of incentive systems for creativity of virtual groups. We investigate the effects of the incentive system for group creativity as an output and for the anteceding sub-stages of group creativity, namely idea generation and idea selection. We focus on incentive systems (FDRSs and UDRSs) in which the supervisor is the intermediary agent who distributes rewards to employees. Although the effectiveness of rewards for creativity has been topic of discussion for decades (Eisenberger and Rhoades 2001; Kachelmeier et al. 2008), scholars have yet to include the role of the supervisor into their considerations. We test the effectiveness of rewards for creativity in virtual groups in an experimental setting.

In line with the SIT, we find that the incentive system influences the perceived interdependence of the goals of virtual group members. Perceiving goals as negatively or positively interdependent evokes substantially different intra-group behaviors which, in turn, affect group creativity (Deutsch 1949; Goncalo and Staw 2006). Our results indicate that employing FDRSs as incentive system evokes a more negative correlation of group members' goals compared to employing UDRSs. The more negative correlation of goals is associated with higher productivity in generating ideas, as group members are motivated to signal high individual effort to their supervisor (Schuh et al. 2018). Further, our analyses show that the more negative correlation of goals induced by FDRSs is associated with higher quality of the idea selection process and higher overall creativity of groups. The results contradict the argumentation of the SIT concerning the idea selection and overall creativity. The more negative correlation of goals under FDRSs was expected to impede the idea selection of virtual groups, as it should have motivated group members to only favor their own ideas, instead of the most creative idea. A reason for the observed relationship may be the structure of the task in the idea selection phase. Group members perceive the idea selection more as a group task than the idea generation. Consequently, caused by the nature of the task, the goals are less negatively correlated in the idea selection phase, compared to the idea generation phase. The correlation of goals may not be sufficiently negative to evoke the hypothesized self-promoting behaviors by the individuals in the group. Additionally, the theory on which we built our assumptions has hitherto only addressed collaboration in in-person groups, but not in virtual groups. However, virtual collaboration reduces the capability to focus on the interrelation of goals, as group members have to invest a share of their cognitive ability to focus on communicating virtually via video screen (Brucks and Levav 2022). The ability to concentrate on the incentive scheme decreases. Consequently, the incentivization is less effective in virtual groups than in in-person groups.

Our research also contributes to practice. For organizations struggling to motivate their employees to be creative, the insights on the effectiveness of incentive systems that are based on supervisor evaluations is vital, as most organizations rely on evaluations of immediate supervisors to assess employee performance (Demeré et al. 2019). Knowing that the interdependence of goals is the underlying mechanism affecting group work, organizations can adapt their incentive systems. While adopting UDRSs is associated with creating a cooperative situation, adopting FDRSs is associated with creating a competitive situation that has the potential to enhance group creativity.

Our research has several limitations that open opportunities for future investigations. First, it is questionable how much the results of student experiments generalize to organizational settings. In our study, we address creative behaviors (i.e., idea generation and selection in groups) and incentive schemes (i.e., FDRS and UDRS) that occur in organizations in a similar way as in our experiment, yet are difficult to assess in a professional context (Loberg et al. 2021; Paulus and Yang 2000). Thus, the use of a student sample provides valuable insights that otherwise would have remained undisclosed. However, the concrete proof that our findings are externally valid remains a topic for future research. Second, we exclusively focus on collaboration in virtual groups. In a follow-up study, we will investigate whether the results are transferrable to in-person groups. Third, the sample reported in this paper consists of 25 groups in two treatments. While 25 units of observation is a small sample compared to other experimental studies, we report significant results on many of our main variables and manipulations. We are confident that the results and the robustness of our analyses will improve further, when we expand our sample size to the

targeted 40 groups. Fourth, our study focuses on the effect of FDRSs and UDRSs on virtual collaboration in one-shot interactions. It would be interesting to observe whether the employees' behaviors change when conducting multiple rounds of our experimental task. Besides the interdependencies of employees' goals, in repeated interactions the perceived fairness of the incentive has a strong influence on employees' behaviors (Loberg et al. 2021).

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