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# Effects of Identifiability and Perceived Co-Worker Effort on Virtual Team Performance

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## ABSTRACT

This paper reports an experiment that investigates how identifiability and perceived co-workers' effort affect a team member's performance in virtual team collaboration. The results indicate that identifiability by itself does not affect group performance. On the other hand, receiving information about co-workers' performance increase group performance regardless of the perceived level of co-workers' performance. In addition, participants who perceived that their co-workers contributed a lot to the group task experienced significantly more social comparison with identified input than with anonymous input. However, this motivation gain did not translate into performance gain. Implications of these results and future research are discussed.

## Keywords

Virtual collaboration, virtual teamwork, social comparison, social compensation, social loafing

## INTRODUCTION

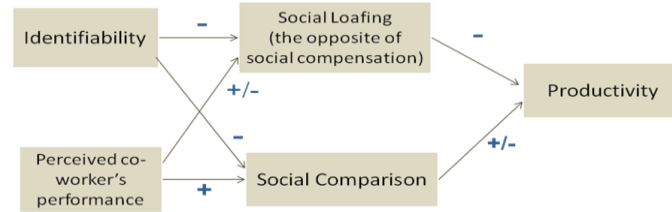
With globalization of business and advancement of information technology, virtual collaboration has become pervasive organization phenomenon. Virtual collaboration refers to group collaboration that is conducted via computer-mediated communication (CMC) in synchronous or asynchronous setting (Cohen and Gibson 2003; (Connaughton & Shuffler, 2007); (Martins, Gilson, & Maynard, 2004); (Powell, Piccoli, & Ives, 2004)). The benefits of virtual collaboration include reduced travelling cost, flexibility of working time and location, and "tapping into a world of talents" (Fuller, Hardin, & Davison, Winter 2006-2007)).

In this study, we investigate the effects of three relevant group processes – social loafing, social compensation, and social comparison – on group performance in asynchronous virtual collaboration. The theory of social loafing predicts that individuals usually expend less effort for group task than for individual task {Chidambaram, 2005 #4}. The social compensation theory predicts that when a team member perceives that her team members have low motivation or low ability for the group task, she would increase her effort to compensate for the team members' poor performance (Todd, Seok, Kerr, & Messé, 2006). The third effect, social comparison effect, may offset the effects of social loafing and social compensation when individuals choose to match their performance with people around them. The effects of these three group processes are entangled, and each of which may be weakened or strengthened in different situations. Extensive research has been done to investigate social loafing, social comparison, and social compensation separately in synchronous environment. To the best of our knowledge, no research has investigated how these three processes manifest and affect individual member's contribution to virtual teamwork at the same time. Our study fills this gap by manipulating two factors, identifiability and perceived co-workers' effort to invoke social loafing, social compensation, and/or social comparison in asynchronous virtual collaboration. The findings of this study will help managers design collaboration process so that group productivity can be maximized by reducing free-ride and by exerting upward social comparison.

## RESEARCH BACKGROUND AND HYPOTHESES

In this study, we focus on how social loafing, social compensation, and social comparison can be evoked by manipulating identifiability and perceived co-worker's performance, as illustrated in

Figure 1.



**Figure 1: Impacts of Identifiability and Perceived co-worker's performance on Group Outcomes**

Social loafing is “the tendency for individuals to expend less effort when working collectively than when working individually” (Karau and Williams 1993). According to previous studies, group cohesiveness is one of the contributing factors to reduced social loafing (Karau & Williams, 1993). In asynchronous virtual collaboration, it may be more difficult to develop cohesiveness among team members than in other types of collaboration environment because the communication between team members is lapsed in space and time, and team members are “invisible”. In such case, getting people acquainted such as knowing each other’s name may help increase the visibility of co-workers and produce more social presence, and subsequently improve group cohesiveness and reduce social loafing. Furthermore, existing literature suggests that identifiability is an important mediator of social loafing (K. Williams, Harkins, & Latané, 1981). Therefore, we speculate that participants with identified input may perform better than those with anonymous input. The specific hypothesis examined is described as follows:

H1: In asynchronous virtual collaboration, participants with identified input will perform better than participants with anonymous input in terms of number of ideas generated.

Another way to reduce social loafing is to invoke social comparison. The theory of social comparison proposed by Festinger (1954) postulates that when opinions and abilities are evaluated, social pressure toward uniformity is present, and this pressure may result in performance matching or competition. Previous research shows that real-time feedback on others’ performance has a positive impact on group outcome by inducing social comparison in synchronous collaboration (see, for example, Shepherd, Briggs et al. 1995). In asynchronous virtual environment, feedback may have the same effect on group outcome when it is provided regularly. However, receiving information on co-workers’ performance may induce social comparison, and social compensation or social loafing among participants depending on the participants’ perception of their co-workers’ performance. When participants feel that their co-workers contribute a little, they may choose to work harder to compensate for the co-workers’ poor performance or engage in downward social comparison. When participants perceive that their co-workers contribute a lot, there may be a tendency for upward social comparison or social loafing. Therefore, we investigate the following hypothesis and research question:

H2: In asynchronous virtual collaboration, participants who receive information about their co-workers’ performance will generate more ideas than those who do not.

RQ1: Who will generate more ideas: participants who perceive that their co-workers contribute a little to the group task or those who perceive that their co-workers contribute a lot?

If participants working with high performers achieve worse performance than participants working with low performers, then it is evident that people tend to engage in social compensation and social loafing when feedback information is available. On the other hand, if participants working with high performers achieve better performance than participants working with low performers, then people tend to engage in social comparison when feedback information is available. However, when a participant perceives that her co-worker contribute a lot to the group task, she may choose to engage in social loafing with anonymous input but engage in social comparison with identified input, leading us to propose:

H3a: Participants who perceive that their co-workers contribute a lot to the group task will generate more ideas when their contribution is identified.

H3b: Participants who perceive that their co-worker contribute a lot toward the group task will experience greater social loafing when their contribution is unidentified.

H3c: Participants who perceive that their co-worker contribute a lot toward the group task will experience greater social comparison when their contribution is identified.

## RESEARCH METHODOLOGY

We conducted an experiment to evaluate the effects of identifiability and feedback on virtual collaboration. The task required participants to generate ideas about how social media such as Facebook can be used to complement traditional classroom teaching and learning. There are six experimental conditions as illustrated by table 1. The participants were required to use a Web-based EMS<sup>1</sup> to post ideas that they generated for the task during the period of five days. We set up the system in the way that the name tags of the participants in conditions 1, 3 and 5 were turned on for identified input, while the name tags of those in conditions 2, 4, and 6 were turned off for anonymous input.

	Identified input (Name tag on)	Anonymous input (Name tag off)
No information about co-workers' effort	Condition 1	Condition 2
Low level of co-worker effort	Condition 3	Condition 4
High level of co-worker effort	Condition 5	Condition 6

**Table 1: Experiment Conditions**

Total 127 students from five introductory MIS classes in a U.S. University participated in the study voluntarily. The experiment adopted a research design that uses simulated group interaction instead of real group interaction in order to avoid confounding effect of real group interaction (Nunamaker, 1992). The participants were told that each of them was randomly assigned to work with a student from another university and the grade would be assigned at the group level. In fact, each participant collaborated with a fictitious group member on the group task. Therefore, there were total 127 groups, each consisting of a real member and a fictitious member. By the end of each day, an experimenter manually logged into each participant's experiment session to inform the participants in conditions 3, 4, 5, and 6 how many ideas were generated by his/her fictitious partner on that day. In order to ensure that the participants were blind of the experimental conditions, we varied the number for each day to make the average number of ideas generated by the fictitious partner to be 2 and 6 for conditions 3-4 and conditions 5-6, respectively. For example, a participant in condition 3 would be informed at the end of each day of the four-day experiment period that her partner had generated 1, 2, 2, and 3 ideas, respectively. A post-test survey was conducted for manipulation check and subjective measures including questions for measuring perceived self and partner's social loafing and social comparison. For the survey, we used 7-likert scale, with 1 indicating strongly disagree and 7 indicating strongly agree.

## DATA ANALYSIS AND RESULTS

The performance of each participant was evaluated by the number of ideas generated. Table 2 shows the average number of ideas generated by the participants in each condition, which does not include the number of ideas generated by the fictitious partners. In each condition, there were a few participants who did not log onto the system or contribute any ideas. We eliminated these participants from the data analysis.

Perceived co-worker's effort	Identifiability	Conditions	Mean	Std. Deviation	N
No information about co-worker's effort	Identified	1	6.05	3.75	19
	Anonymous	2	7.48	5.04	21
Low level of co-worker's effort	Identified	3	14.60	7.74	15
	Anonymous	4	11.19	9.25	21
High level of co-worker's effort	Identified	5	10.90	5.79	20
	Anonymous	6	12.21	8.30	19
Total			10.23	7.30	115

**Table 2: Ideation Results**

<sup>1</sup> We used Categorizer tool in the GroupSystems Thinktank product.

H1 predicts that identifiability will affect group performance, in other words, participants with identified input will generate more ideas than participants with anonymous input. The result indicated that the contrast between identified input (conditions 1, 3, and 5) and anonymous input (conditions 2, 4, and 6) was not statistically significant ( $F = 0.03$ ,  $df = 1$ ,  $p = 0.86$ ). The data did not support H1.

H2 predicts that participants who receive information about their co-workers' performance will generate more ideas than those who do not. We conducted two comparisons to test H2. The first comparison revealed that participants who received information about their poor-performing co-workers produced significantly more ideas than participants who did not receive any information about their co-workers (conditions 3 and 4 vs. conditions 1 and 2) ( $F = 14.72$ ,  $df = 1$ ,  $p < 0.001$ ). The second comparison revealed that participants who received information about their high-performing co-workers produced significantly more ideas than participants who did not receive any information about their co-workers (conditions 5 and 6 versus conditions 1 and 2) ( $F = 9.51$ ,  $df = 1$ ,  $p = 0.003$ ). Therefore, H2 was supported.

RQ1 investigates whether or not participants who perceive that their co-workers contribute a little toward the group task will generate more ideas than participants who perceive that their co-workers contribute a lot. The comparison between conditions 3+4 and conditions 5+6 indicates that there was no significant difference between the two groups in terms of group performance ( $F = 0.70$ ,  $df = 1$ ,  $p = 0.406$ ). The answer was inconclusive.

H3a predicts that participants who perceive that their co-workers contribute a lot towards the group task will generate more ideas when their input is identified. A comparison between condition 5 and condition 6 indicated that there was no significant difference between the numbers of ideas produced by these two groups ( $F = 0.35$ ,  $df = 1$ ,  $p = 0.354$ ). H3a was not supported.

H3b predicts that participants who perceive that their co-workers contribute a lot towards the group task will experience greater social loafing with anonymous input than identified input. Two comparisons were conducted between condition 5 and condition 6 based on data collected from the post-test survey: self loafing and partner's loafing. There was no significant difference between the two groups in terms of self loafing ( $p = 0.82$ ). The means were 2.20 and 2.11 for condition 5 and 6 respectively. Participants in both conditions did not feel that they engaged in social loafing. There was also no significant difference between the two groups in terms of perceived partner's loafing ( $p = 1.0$ ). The means were 1.88 and 1.55 for condition 5 and 6 respectively. Participants in both conditions did not feel that their partners engaged in social loafing. H3b was not supported.

H3c predicts that participants who perceive that their co-workers contribute a lot towards the group task will experience greater social comparison with identified input than anonymous input. We compared the perceived social comparison between condition 5 (Mean = 3.93) and condition 6 (Mean = 2.81), the difference was statistically significant ( $F = 9.44$ ,  $df = 1$ ,  $p = 0.004$ ). H3c was supported.

## DISCUSSION

This study provides additional evidence for the role of feedback information in asynchronous virtual collaboration. The results suggest that providing information about co-workers' performance increases performance of individuals engaged in asynchronous idea generation. This finding is consistent with prior results demonstrating that such information can improve group performance in asynchronous virtual collaboration.

Previous research has focused on social comparison as it is the only process induced in group process. The results of our study suggest that social comparison may not be the only group process that is invoked when participants receive information about their co-workers' performance. When working with a high performer, a person may engage in upward social comparison and match her performance with the co-worker. On the other hand, if a person perceives that her co-worker does not perform well, then she may go beyond her normal level of performance to compensate for her co-worker's poor performance so that the group product and its evaluation will be respectable. Even though there was no significant difference of the perceived social compensation between participants working with low-performers and participants working with high-performers, the social compensation effect seems to be illustrated in condition 3 where participants generated the greatest number of ideas among all conditions. This observation indicates that social compensation effect existed in this study, but it was weak.

There are two possible explanations to why social compensation was weak. According to previous studies

((Plaks & Higgins, 2000); (Todd, Seok, Kerr, & Messé, 2006); (K. D. Williams & Karau, 1991)), one necessary condition to invoke social compensation is to engage a meaningful task. The results of the post-test survey indicated that the participants slightly disagreed that the task was meaningful and relevant to them. Although the participants were aware that their solutions would be graded and they would be assigned grades at the group level. We intentionally avoided providing any further details on the grading criteria in order to minimize any bias. Another necessary condition to invoke social compensation among team members is the perception that their co-workers' performance is poor. In our experiment, some participants did not feel that contributing two ideas daily (totaling eight ideas during the experiment period) was poor performance. In fact, 64% of the participants felt that the possible number of unique ideas for this task was less than eleven, indicating that manipulation of low performance may not be sufficient.

Contrary to our belief, the results revealed that identifiability did not have a main effect on individual's performance in virtual team collaboration. The number of ideas generated by participants with identified input was not significantly different from that by participants with anonymous input. According to Social Impact Theory, the dilution effect (where an individual feels submerged in the group) is one of the contributing effects to social loafing (Chidambaram & Tung, 2005). The lack of dilution effect in small groups as in our case may have reduced social loafing in anonymous conditions. In addition, the participants of this experiment did not know or interact with their partners. Therefore, the level of social presence in the identified conditions was not much higher than that in the anonymous conditions.

However, participants working with high-performers experienced greater social comparison with identified input than anonymous input, indicating that the manipulation of identifiability was successful. Unfortunately, the increased social comparison effect did not translate into performance gain. On the other hand, when a co-worker performed poorly, there was no significant difference in terms of perceived social comparison between the participants who worked in identified setting and those who worked in anonymous setting. The result may be attributed to the insufficient manipulation of co-workers' low performance, as previously mentioned.

There are three interpretations of why increased social comparison did not translate into performance gain. First, increased social comparison did not necessarily translate into a behavior change that is substantial enough to produce significantly different outcome. Second, participants who perceived more social comparison might not be able to generate more ideas than those who perceived less social comparison due to ceiling effect. To investigate whether there was a ceiling effect, we examined the question "I feel that the possible number of unique ideas for this task is: 1) under five, 2) 5-10, 3) 11-20, 4) 21-30, and 5) above 30." Only 13 out of 113 participants agreed that the possible unique number of ideas for the task was more than 20, whereas the total number of ideas for the high level of performance is 24 (average 6 ideas a day for four days). The ceiling effect was apparent. However, our study did not inform whether the ceiling effect was the only cause of the result, or it was just one of the causes.

## CONCLUSION

Our study indicates that identifiability by itself does not produce motivation gain or loss in asynchronous interaction as illustrated by previous studies of synchronous interaction. Receiving information about co-worker's performance, on the other hand, produces motivation gain. The motivation gain may be due to upward social comparison. However, we believe that it could also be the result of social compensation. Further research is needed to investigate which effect is stronger in which situations. Specifically, an examination of attribution theory may help assess the impact of high and poor performers on other team members. Our study also suggests that team members experience more social comparison when working in an identified setting than working in an anonymous setting with high performers. Therefore, identifiability has the potential to affect group performance when group interact asynchronously. This potential needs to be tested in future studies.

This study has a number of limitations. First, the manipulation of low performance was not sufficient. Second, experiment task was not regarded as very meaningful or relevant to the participants. Third, we studied two-member groups in which free riding is not as common as in larger groups. Lastly, we used students as subjects in the study. Therefore, generalization of the findings of this study to virtual teams in real organizations may be restricted. Despite these limitations, we believe this study further our understanding of the co-effects of social loafing, social compensation, and social comparison. The findings of the study may help virtual team members to maximize their group performance by setting up the group interaction environment accordingly.

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