Reflections on group cognitive synergy

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Common managerial wisdom suggests that groups are effective ways of organizing work because they integrate various resources (including knowledge) of their members in order to achieve superior performance and accomplish organizational goals that are too difficult for their individual members. However, research to date, suggests that this assumption might not always be realistic as organizational groups are hotbeds for conflict and turmoil (De Dreu & Weingart, 2003), are conducive for free riding behaviors and social loafing (Karau & Williams, 1993) and individual participation in small group settings is often skewed with only a few members contributing a lot and the majority of the group members having only few interventions during group debates (Curşeu, 2006a). Moreover, historical evidence abounds with examples of groups composed of bright individuals that made (collectively) faulty decisions, sometimes with pervasive social impact because they failed to make use of group members' knowledge and expertise. Some of the failures attributed to defective information processing in decision-making groups include the Challenger (28 January 1986) and Columbia (1 February 2003) Space Shuttle disasters, and the decision made by the Ethyl Corporation (1925) to add toxic lead to gasoline (which changed Earth's atmosphere forever). Therefore, group synergy, although assumed to emerge automatically in small groups, is in practice, more difficult to achieve. One of my core research interests was to uncover how cognitive synergy can be achieved in small group settings. In other words, I tried to explore how groups can surpass the average performance of their members or achieve things that no individual member alone could achieve. The aim of this paper is to summarize some of my research attempts to find out ways in which cognitive synergy can be facilitated. I begin by defining group cognitive synergy starting from the general group synergy concept (Hackman, 1987; Larson, 2007) and then summarize a few empirical studies that explored the antecedents (or attempts to foster the emergence) of cognitive synergy in small groups.

Group cognitive synergy defined

Hackman (1987) defines group synergy as group level phenomena that emerges from the interactions among members and affect how well a group deals with the task-related demands and opportunities (Hackman, 1987 p. 335). According to Larson (2007, 2010), group synergy refers to an objective gain in group performance as compared to summed individual performances that is attributable to group interaction. In other words, group synergy is achieved when the collective performance of interacting individuals exceeds the performance achieved by simple, preprogrammed combination of standalone group member efforts (Larson, 2007, 2010). Larson (2007, 2010) further differentiates between strong and weak synergy. Groups achieve weak synergy when collective performance is better than the average performance of group members and strong synergy, when collective performance exceeds the performance of the best performing individual in the group (Larson, 2007, p. 415). In line with these general definitions of group synergy, I define group cognitive synergy as group level cognitive structures that emerge from the interactions among members and the co-evolution of their

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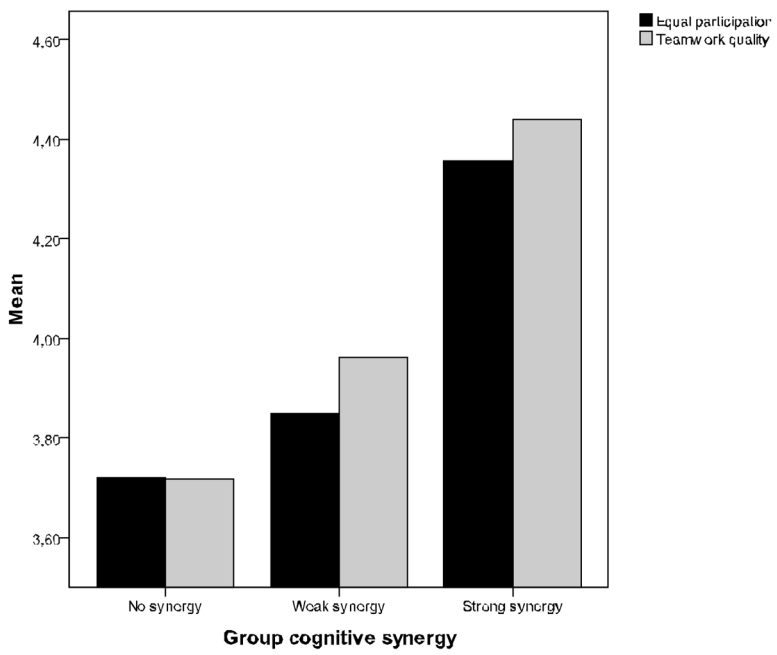
individual cognitive structures (Curşeu, 2006a; Curşeu, Schruijer and Boroş, 2007). Therefore, group cognitive complexity as defined in Curşeu, Schruijer and Boroş (2007) and operationalized in Curşeu, Schalk and Schruijer (2010) is a measure of group cognitive synergy.

Teamwork quality and group cognitive synergy

Teamwork quality reflects the nature of interpersonal interactions within groups and it is closely related to group synergy. I explore further on the association between teamwork quality and cognitive synergy in groups using the data reported in Curşeu, Schruijer and Boroş (2007). In this study, one hundred and thirty two students were asked to take part in a cognitive mapping exercise first individually and then in groups of three or four. The complexity of individual and group cognitive maps was computed using the integrative cognitive complexity framework extensively presented in Curşeu, Schalk and Schruijer (2010). I have further analyzed the data reported in Curşeu, Schruijer and Boroş (2007) to illustrate differences in teamwork quality and equal participation as reported by group members as they were part of groups with no synergy (group cognitive complexity is lower than the average individual cognitive complexity and lower than the highest individual cognitive complexity), weak cognitive synergy (group cognitive complexity is higher than the average individual complexity within groups) and strong cognitive synergy (GCC is higher than the highest individual cognitive complexity). The results for the two interpersonal interaction variables are presented in Figure 1.

As shown in Figure 1, groups with strong cognitive synergy report the highest levels of teamwork quality and equal participation, followed by groups with weak synergy. I also used the t test for independent samples to test the paired differences. Groups with strong synergy reported better teamwork quality (M=4.43, SD=.47) than the groups with weak cognitive synergy (M=3.96, SD=.38) – t=2.48, p<.02 – and no cognitive synergy (M=3.71, SD=.60) – t=3.19, p<.003. Moreover, groups with strong synergy reported higher scores for equal participation (M=4.35, SD=.51) as compared to groups with weak cognitive synergy (M=3.84, SD=.26) – t=2.89, p<.01 – and groups with no synergy (M=3.72, SD=.51) – t=3.18, p<.003. Finally, groups with weak cognitive synergy reported better teamwork quality and equal par-

Figure 1. Equal participation and teamwork quality as a function of group synergy (based on data reported in Curşeu, Schruijer and Boroş, 2007)

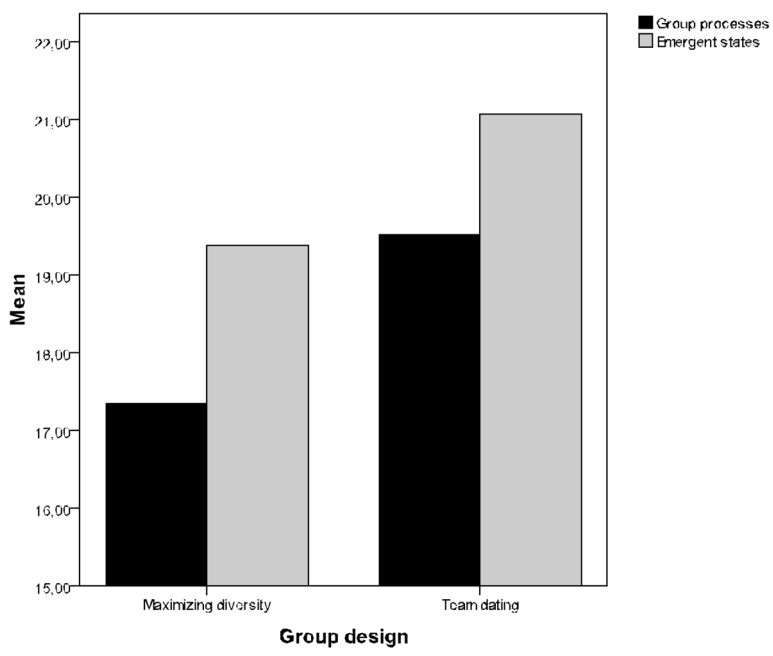


ticipation as compared to groups with no cognitive synergy, yet the difference was not statistically significant. It must be stated at this stage that the way the comparison is reported here should not be used to make causal inferences, in that neither cognitive synergy nor teamwork quality or equal participation were manipulated in this study. The results as reported here should be used to simply draw the conclusion that groups with strong cognitive synergy report better teamwork quality and equal participation when compared to groups with weak or no cognitive synergy. In conceptual terms, as argued in the previous section, it is more likely that participation and quality of interpersonal interactions (teamwork quality) generate cognitive synergy in groups. In line with this argument, we show in another paper that teamwork quality mediates the impact of different forms of group diversity on group cognitive complexity (Curşeu & Pluut, in press). Moreover, in a study on group creativity (Curşeu, 2010) I show that task conflict and planning processes mediate the impact of group disparity and group variety on group creativity and group cognitive complexity. Task conflict in particular seems to foster group creativity, which in turn is beneficial for group cognitive synergy (group cognitive complexity) (Curşeu, 2010). Similarly we show in another study (Curşeu, Janssen & Raab, in press) that task conflict is beneficial, while relationship conflict is detrimental for group cognitive complexity. We also show that both task and relationship conflict depend on the structure of the communication network within groups, with network fragmentation stimulating task conflict and network density reducing relationship conflict (Curşeu, Janssen & Raab, in press). A particular way of stimulating cognitive synergy in groups is by improving the quality of interpersonal interactions in groups. This particular claim is also in line with research on group processes, showing that action phase, transition phase and interpersonal processes are all conducive for group effectiveness (LePine, Piccolo, Jackson, Mathieu & Saul, 2008).

Reciprocated relational preferences, teamwork quality and cognitive synergy

Research to date explored the effectiveness of various design strategies for organizational groups, yet the question of how to compose

Figure 2. Comparison between groups formed by maximizing within group diversity and team dating teams (dependent variables are group processes and emergent states) (based on the data reported in Curşeu, Kenis, Raab & Brandes, 2010)



effective groups has no unequivocal or definite answer (Hodgkinson & Healey, 2008). In an empirical study reported in Curşeu, Kenis, Raab and Brandes (2010) we test the effectiveness of team dating (a team formation strategy based on optimizing reciprocated relational preferences) as a team design strategy. We used insights from the thin-slices of behaviour literature (Ambady and Rosenthal 1992) and first impression formation (Jones 1990) to argue that first opinions developed based on short interpersonal interaction are predictive for the development of interpersonal relations in the future. We use a social network analytic framework to optimize expressed relational preferences among potential group members in such a way that reciprocated preferences are maximized within groups and minimized between groups. Our results show that as compared to groups formed by maximizing diversity, group composed based on expressed relational preferences (team dating groups) experience higher teamwork quality (group processes and emergent states) and perform better in cognitive tasks (have higher group cognitive complexity) (Curşeu, Kenis et al., 2010). A summary of the results for group processes and emergent states (used to evaluate teamwork quality) is presented in Figure 2.

In another study reported in Curşeu, Kenis and Raab (2009) we explore the extent to which diversity leads to relationship conflict in groups formed by randomly assigning group members to groups and groups formed through team dating. Our results show that group diversity is less likely to generate relationship conflict in team dating teams than in randomized groups. As relationship conflict is always detrimental for group performance (DeDreu & Weingart, 2003) we can conclude that team dating reduces process losses in groups. All in all, both empirical studies (on reciprocated relational preferences) summarized above show that maximizing reciprocated relational preferences in groups has synergetic effects (improves teamwork quality and reduces the emergence of relationship conflict). The basic principle of team dating is that it uses a social network framework to maximize the reciprocated relational preferences within groups. Therefore, a "perfect group" formed using team dating would be a group in which each member expresses strong relational preferences for all the other members in the group. Such a group is likely to experience few process losses and a higher quality of teamwork interactions and as a consequence group members are more likely to contribute with their unique knowledge and specific expertise to the group task. As reported in Curşeu, Kenis et al (2010), team dating groups develop more complex collective cognitive structures as compared to groups formed by maximizing diversity. These results support the claim that reciprocated relational preferences are antecedents of cognitive synergy in groups. Reciprocated relational preferences are also likely to stimulate debate (Curşeu, Kenis & Raab, 2009), as group diversity is more likely to trigger task conflict in team dating rather than randomized groups. This means that team dating has also the potential to stimulate participation to group discussion and group debates. I argued that participation in ad-hoc groups is skewed and in such groups in which only a few members participate, cognitive synergy is less likely to occur than in groups in which all members participate equally to group debates (see Figure 1).

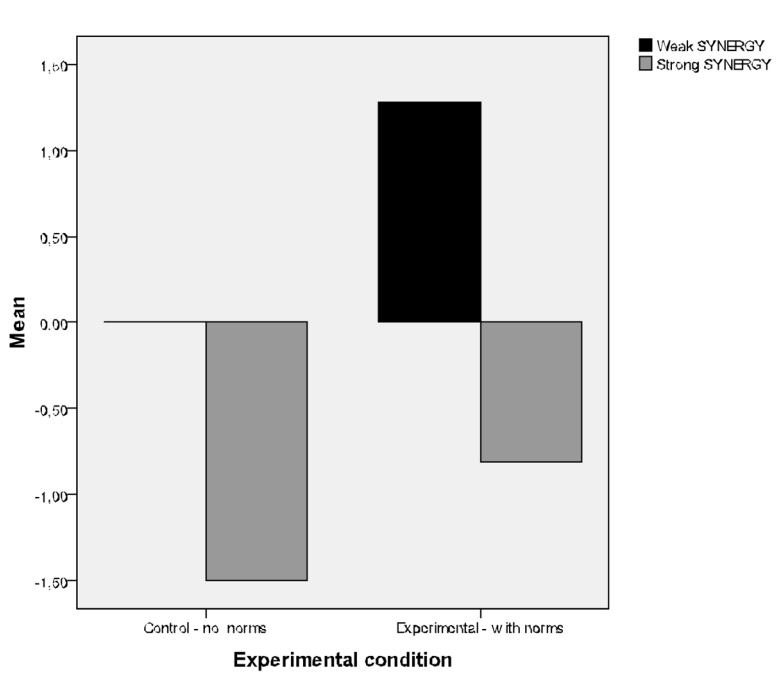
Normative interventions and group cognitive synergy in decision-making tasks

Literature on group decision making abounds with techniques that can be used to improve decision quality in groups. Simple normative interventions have been shown to foster synergy in decision-making groups (Hall & Watson, 1967). These normative interventions or the group consensus method as initially labeled by Hall and Watson (1967) uses a set of ground rules for group work and participants are instructed to: (1) avoid arguing about initial opinions, views and preferences, (2) avoid "win-lose" statements, (3) avoid conforming to a majority in order to reduce conflict and reach social harmony, (4) avoid conflict-reducing techniques (e.g., majority vote, average individual preferences, etc), (5) view differences of

opinion as natural and helpful, (6) view initial agreement as suspect (Hall & Watson, 1967, p.304). The aim of these ground rules for achieving consensus is to reinforce equal participation in groups and eventually foster group synergy. In an empirical study reported in Curşeu and Schruijer (in press) we test the impact of these normative interventions on group rationality and group cognitive complexity. In the first empirical study we show that normative interventions lead to more complex collective cognitive representations and the effect is stronger in established rather than ad-hoc groups. In the second empirical study we test the impact of the same normative interventions on group rationality. We define group rationality as an emergent group level competence that results from individual competencies and the interaction processes within groups. The quasi experimental study uses a set of ten decision tasks described in Curşeu (2006a) to first evaluate individual rationality and then participants are asked to perform the same decision tasks in established groups having 4 to 7 members. Due to the design we can evaluate both weak as well as strong synergy (as defined by Larson, 2007). As such we can further estimate the impact of normative interventions on both measures of cognitive synergy (these analyses were not reported in the original paper). Weak cognitive synergy was computed by subtracting the score of group rationality (the results of the group decision task) from the average individual rationality, while strong group synergy was computed by subtracting the group score from the highest individual score. The results of the comparison between the groups that received the normative intervention and those that did not have any intervention, is presented in Figure 3.

As depicted in Figure 3, groups that received normative intervention have higher scores on weak synergy as compared to groups that did not receive normative intervention ($t=3.96$, $p<.001$). Moreover, the difference between groups with and groups without normative intervention is significant also for strong synergy ($t=2.90$, $p<.006$), nevertheless, both scores are negative as depicted in Figure 3. This means that in absolute terms, normative interventions generate weak but not strong synergy because the best individual in the group outperforms the group in both conditions (with and without normative interventions). Unless the group does better than the best performing individual in the group, strong synergy is not achieved. This pattern of results opens a new venue for research namely minority dissent as a way to achieve group cognitive synergy. We

Figure 3. The comparison between groups with and groups without normative interventions (based on the data reported in Curşeu and Schruijer, in press)



showed that groups experiencing minority dissent exhibit greater cognitive complexity when compared to groups without minority dissent (Curşeu, Schruijer & Boroş, in press). Dissent seems to foster cognitive activity in groups and it could be a useful strategy (in addition to equal participation) to achieve strong cognitive synergy in groups. Group members (especially the knowledgeable ones) should be stimulated to participate and contribute to the group debates (as dissenters) and this would ultimately lead to (strong) cognitive synergy in groups, as strong cognitive synergy is achieved only if the group as a whole outperforms its worthiest member.

Conclusions

Cognitive synergy is not a given in small group settings. Superior group performance is nevertheless the result of synergetic interactions among group members. Therefore, in line with Larson (2010), I argue that it is essential to understand the conditions under which cognitive synergy occurs in small groups. This paper explored the conceptual foundations of group cognitive synergy and shortly reviewed a few ways in which cognitive synergy can be achieved in small groups. I show that group cognitive synergy is positively associated with teamwork quality and equal participation in groups. Further on I argue that reciprocated relational preferences can effectively be used to foster teamwork quality and ultimately cognitive synergy in groups. Moreover, I show that normative interventions are simple and effective ways of achieving weak (rather than strong) cognitive synergy in groups. I conclude that further research should explore the interplay between dissent and equal participation as antecedents of cognitive synergy in groups.

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