Collective Intelligence in Human Groups

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April 19, 2012
The Collective . . .

- Ishani Aggarwal, Carnegie Mellon
- Christopher Chabris, Union College
- Nada Hashmi, MIT
- Thomas Malone, MIT

Special thanks to NSF and Cisco Systems for financial support of the research
The Puzzle of Collective Intelligence

Ant Colony

Animal Herd

Flock of Birds
The Question

- Does general collective intelligence exist in human groups?
Individual Intelligence

• Spearman’s $g$

Charles Spearman
The “g-factor”
Collective Intelligence

- Is there evidence of a general collective intelligence (a “c” factor) in groups?
- Can we isolate a small set of tasks that is predictive of group performance on a broader range of more complex tasks?
- Does c have predictive validity beyond individual intelligence of group members?
- How can we use this information to build a better science of groups?
Study 1

Task 1
Task 2
Task 3
Task 4
Task 5

Collective Intelligence

Average IQ

Video Game Score

χ² = 13.92 p = .45; CFI = .99

Study 2

Collective Intelligence

Task 1
Task 2
Task 3
Task 4
Task 5

Average IQ
Architectural Design Task

\[ \chi^2 = 4.05, p=.13; \text{CFI} = .94 \]

107 groups of sizes 2, 3, 4, and 5

Predictive value of $c$ and $g$ factors

Study 1: Video Game
- Collective Intelligence: 0.5
- Average Member Intelligence: 0.1
- Maximum Member Intelligence: 0.0

Study 2: Architectural Design
- Collective Intelligence: 0.4
- Average Member Intelligence: 0.1
- Maximum Member Intelligence: 0.2

Woolley, Chabris, Pentland, Hashmi & Malone, 2010
Collective Intelligence & Learning

Aggarwal, Woolley, Chabris & Malone, under review
What Predicts Collective Intelligence?

- *Not* group satisfaction \((r = -0.07)\) cohesion \((r = -0.12)\), or motivation \((r = -0.01)\)
- Not personality
- Proportion of females in group \((r = 0.23, p < 0.05)\)
The Female Factor

The chart plots the collective intelligence scores of the 192 teams in the study against the percentage of women those teams contained. The red bars indicate the range of scores in the group of teams at each level, and the blue circles, the average. Teams with more women tended to fall above the average; teams with more men tended to fall below it.

Source: Harvard Business Review
Why do women enhance c?

- Social sensitivity ($r=.26$, $p<.05$)
## Social Sensitivity

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<tr>
<td>Playful</td>
<td>Comforting</td>
<td>Irritated</td>
<td>Bored</td>
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![Image of eyes](image-url)
What enhances c?

- Social sensitivity ($r=.26$, $p<.05$)
- Communication patterns
CI and Communication

- Uneven distribution in speaking turns negatively predicts $c$
- Higher proportion of women leads to more even distribution of speaking

Sociometric Badge
What enhances c?

- Social sensitivity ($r=.26, p<.05$)
- Communication patterns
- Diversity
Cognitive Diversity & c

Aggarwal, Woolley, Chabris, & Malone, under review
Summary and Conclusions

• Our studies suggest that collectives exhibit a characteristic level of intelligence which is
  – distinct from skills of individual members
  – predictive of future performance

• Knowledge of c can enhance science of team performance
  – Provide a more robust dependent variable to use in studying the effects of tools and interventions
Future Directions

• Further explore what predicts $c$
• Use the CI battery to predict team performance in other contexts
  – Groups in online environments
  – Teams in organizational settings
• Study interventions and tools that enhance the processes known to enhance $c$
Thanks!

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