Groups Matter

Can we improve Software Engineering performance by studying tasks and groups?

Task Types

- **Additive Tasks** are when the outcome is the sum of individual contributions. e.g. Running a Relay Race
- **Conjunctive Tasks** are when the outcome is determined by the worst member. e.g. Climbing a mountain with climbers roped together
- **Disjunctive Tasks** are when the output is determined by the best member. e.g. Submission of multiple tenders for a project

The Assembly Bonus Effect is when the output is greater than the sum of individual efforts. e.g. The Letters to Numbers Problem

Can we find the Assembly Bonus Effect in Software Engineering groups?

The Experiment

A convenience sample of 38 Masters Students participated in a task of highly intellective nature. The participants were randomly assigned to form 9 groups of three and 11 individuals. The participants performed the task twice.

The task was a letters-to-numbers1 problem that had been coded to be available online. The solution is randomised for each participant and the results logged automatically. The score was determined by the number of trials required to reach a solution, with less trials as better.

The task is available now at letters-to-numbers.alvin.teh.net.au. Approach the presenter if you would like to try it.

The Results & Conclusion

ANOVA analysis was performed on the collected data, using \( p = 0.05 \).

<table>
<thead>
<tr>
<th></th>
<th>1st Iteration</th>
<th>2nd Iteration</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
<td>( \eta = 5.29 )</td>
<td>( \eta = 4.88 )</td>
<td>( \eta = 11.06 )</td>
</tr>
<tr>
<td>( \sigma )</td>
<td>( \sigma = 1.89 )</td>
<td>( \sigma = 1.83 )</td>
<td>( \sigma = 3.83 )</td>
</tr>
<tr>
<td><strong>Individual</strong></td>
<td>( \eta = 7.82 )</td>
<td>( \eta = 8.09 )</td>
<td>( \eta = 15.70 )</td>
</tr>
<tr>
<td>( \sigma )</td>
<td>( \sigma = 2.36 )</td>
<td>( \sigma = 2.95 )</td>
<td>( \sigma = 4.47 )</td>
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</tbody>
</table>

On average, groups required fewer attempts to solve the problem.

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</thead>
<tbody>
<tr>
<td><strong>F</strong></td>
<td>5.70</td>
<td>5.96</td>
<td>5.09</td>
</tr>
<tr>
<td><strong>F_{crit}</strong></td>
<td>4.49</td>
<td>4.54</td>
<td>4.54</td>
</tr>
</tbody>
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Therefore, we can say that there is a significant difference in performance between Software Engineers in groups compared to individuals, for such intellective tasks.

If we can identify similar intellective tasks in Software Engineering, we can improve the likelihood of good performance by assigning such tasks to groups as opposed to individuals.

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1Adapted from: Laughlin, P.R., Bonner, B.L. and Miner, A.G., Groups perform better than the best individuals on letters to numbers problems, Organizational Behavior and Human Decision Processes, Vol 88, No. 2, pp 605-620, 2002

2Adapted from: Linberg, K., Software developer perceptions about software project failure: a case study, The Journal of Systems and Software, Vol. 49, pp. 177-192, 1999

