Are Permanent or Temporary Teams More Efficient: A Possible Explanation of the Empirical Data

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Abstract

It is known that in education, stable (long-term) student teams are more effective than temporary (short-term) ones. It turned out that the same phenomenon is true for workers working on a long-term project. However, somewhat surprisingly, for small-scale projects, the opposite is true: teams without any prior collaboration experience are more successful. Moreover, it turns out that if combine in a team members with prior collaboration experience and members without such experience, the efficiency of the team gets even lower. In this paper, we provide a possible explanation for this strange empirical phenomenon.

1 Formulation of the Problem

In education, permanent (or at least stable) teams are more efficient. In the education environment, empirical data shows that when students form stable long-term teams to study together, the results are much better than when form temporary team for each class or even for each assignment; see, e.g., [2, 4].

This is not just an empirical fact: there are theoretical explanations for this phenomenon; see, e.g., [3].

Surprisingly, in industry, sometimes temporary teams are more efficient. Based on the results of education-related studies, one would expect that in industry, similarly, stable teams should be more efficient.

Surprisingly, a recent empirical study [1] shows that while stable teams are indeed more efficient for big long-term projects, for small short-term projects, temporary teams turned out to be more efficient.

This does not contradict the education experiments, since education is clearly a long-term project, but still it is unexpected.

One would also expect that for the long-term projects, the larger the proportion of people with prior collaboration experience, the more productive the team. This turned out to be true only when more than a half of the team had such prior experience. When few people with prior experience were added to the team, this decreased the team's efficiency.

What we do in this paper. In this paper, we provide a possible explanation for these empirical facts.

2 Possible Explanation

Planning is helpful. In general, for the collaboration to be efficient, team members need to plan their joint activity. Once the plan is in place, the work is more efficient – but, of course, planning takes time.

We can describe this in numerical terms. Once a good plan is agreed upon, then the task that would otherwise require time t takes time $c \cdot t$, for some $c < 1$. Let t_0 be the time that needed to come up with a good plan for this particular task.

This explains why for long-term projects, experiences teams are more efficient. Experienced teams know the importance of planning. Thus, when they are given a new task, then, instead of starting to work on it right way, they first spend some time coming up with an efficient plan of work. As a result, the overall time that the team needs to finish the project is equal to the sum of the planning time t_0 and the time $c \cdot t$ need to implement this plan.

In contrast, an team with no prior collaboration experience may start working on a project right away – especially since the supervisors usually want to see everyone working right away, not doing some nebulous "planning". Thus, the team with no prior collaboration experience will spend the original time t working on this project.

Since $c < 1$, for sufficiently large t – i.e., for sufficiently long-term projects – the time $t_0 + c \cdot t$ is smaller than t. The inequality $t_0 + c \cdot t < t$ is equivalent to $t_0 < (1 - c) \cdot t$, i.e., to

$$t > \bar{t} \stackrel{\text{def}}{=} \frac{t_0}{1 - c}.$$

Thus, for any project that takes time longer than $\bar{t}$, teams with prior collaboration experience are indeed more efficient.

What happens for short-term projects. For short-term projects, with small t, a team with no prior collaboration experience still spends time t.

However, a team with a collaboration experience may still try to use their prior experience and still want to plan. As a result, it is highly probable that

this team will still spend the time $t_0 + c \cdot t$ on this project – but for small t, this is a waste of time, since for small $t < \bar{t}$, we have $t_0 + c \cdot t > t$.

What if we have a mixture of people with prior collaboration experience and new folks with no such experience? In the previous text, we considered two extreme cases:

- the case when we had the exact same team as before, and

- the case when the team is completely new, with no experience of prior collaboration between its members.

In reality, we may have all kinds of intermediate situations, when some folks on the current team have prior collaboration experience, while others do not have such experience.

What happens then? As we have mentioned earlier, people with prior collaboration experience will try to argue for planning, while people without prior collaboration experience will argue for starting to work right away. Usually, members of the team are of approximately the same rank and the same experience, so all team members have approximately the same weight in decision making. As a result, the majority wins.

However, the majority needs to take time to convince the minority. This "convincing" time adds to the time needed for the team to finish the project. Thus, whether we add a few people with no collaboration experience to a previously collaborated team or we add a few people with experience of collaboration to the team without such experience, the overall time needed to finish the project decreases due to the convincing time.

Moreover, the more people are in this needed-to-convinced minority, the more time it will take to convince them, and thus, the more extra convincing time will be added to the project. This is exactly what is described in [1]: that, starting with the case of no people with prior collaboration experience, the overall time decreases as we add more people with such experience – until we reach a turning point when approximately half of the people on the team have prior experience. Starting from this point, as we add more people with prior collaboration experience to the team, we spend less and less time on the project – until we reach the highest efficiency when all the team members have prior collaboration experience (since in this case, there is no need to the extra convincing time).

The seemingly strange experimental data is thus explained.

Acknowledgments

References

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