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Smaller teams—better teamwork: How to keep project teams small☆

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Abstract Scholars and practitioners have long suggested that smaller teams perform better teamwork, yet it is surprising to find that many organizations are using teams of 10 and more members. This paper explains how large team size affects teamwork. Moreover, it suggests four ways to keep teams small: (1) Create a multiteam project; (2) create a core team and an extended team; (3) outsource tasks and define team-external contributions; and (4) keep members on the team only for specific project phases.

1. The size of teams

Team size matters, with smaller teams demonstrating better teamwork. From early research by Ziller (1957) and Steiner (1966) to more recent models of team effectiveness (e.g., Hackman, 1987), team size has been considered an important structural variable determining team processes (e.g., team collaboration, social loafing, etc.) and, subsequently, team performance (i.e., the effectiveness and efficiency of task completion). Laboratory research suggests that smaller teams provide for more direct and efficient intra-team communication (Bray et al., 1978), greater effort by all team members (i.e., reduced social loafing; Latané et al., 1979), and, hence, a better utilization of all team members' potential.

Despite such evidence, teams in business organizations today are often too large. Project leaders and managers commonly aim for securing a maximally large head count for their project to 'ensure' that objectives can be met. In cross-functional projects, such 'inflated' teams are often the result of departmental interests. All organizational units that are potentially affected by the team's work want to be represented in the project.

This was the case, for example, in a large-scale product-development project within the European automotive industry. Leaders of the 39 teams involved reported that their teams were, on average, too large by 1.2 members, with team members generally endorsing this assessment, judging their teams too large by 0.8 members. The teams in this project had between 3 and 16 members, with an average of 9.4 members per

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team. None, however, suffered from a lack of work; to the contrary, all teams were hard pressed to keep up with project deadlines, but both team leaders and members recognized that the sheer size of their teams created trouble. As outlined in this article, their intuitive notions regarding team size affecting their teams' ability to perform are correct and supported by theory, as well as empirical evidence.

In light of prior research that confirms the benefits of smaller teams and the contrasting tendency of organizations to do the opposite by inflating teams, this article has two main objectives. First, it explains how increasing team size negatively affects performance-relevant team processes, such as information sharing. Second, it outlines four ways for managers of team-based organizations to keep teams small.

2. Teams and teamwork

Teams are social systems of two or more people that are embedded in an organization (context), whose members perceive themselves as such and are perceived as members by others (identity), and who collaborate on a common task (teamwork). It is the last part of this definition that differentiates teams from other formal organizational groups or units, such as departments and divisions. Teamwork, or the collaborative work process toward a common task, creates limits regarding the number of members that a team can have while still functioning well as a collaborative work unit.

Teams, like any other organizational unit, need adequate staffing in terms of both quality and quantity of personnel. Unlike less collaborative forms of work organization, however, a team's work performance depends on its ability to efficiently and effectively work in a directly interactive mode to achieve a common team output. In less collaborative organizational units, the collective output largely represents the aggregate of individuals' work products. For instance, customer service agents conduct their work of answering customer calls largely independently from other departmental members. While the agents might cross-train and support one another or collectively set work schedules, their primary work is done individually, often supported by a supervisor who may provide assistance on more difficult customer requests. By contrast, team members are mutually dependent on one another in their effort to produce a common team output. For instance, in a software development team, programming engineers, computer hardware engineers, systems network experts, and software application field experts (e.g., accountants, if the software developed was accounting software) need to collaborate to design and develop a coherent software product. Here, the emphasis is not on individual outputs, but on the common output that team members work interactively toward. Hence, teamwork is the essence of a team's work process, while less collaborative work organizations rely chiefly on individuals' work processes.

Conceptual and empirical analyses by Hoegl and Gemuenden (2001) on teamwork quality, and similarly by Sethi and Nicholson (2001) on charged team behavior, acknowledge that performance-relevant team processes include not only task-related elements, such as cooperation and integration, but also social elements such as enthusiasm, drive, and commitment. To capture the complex nature of team members working together, Hoegl and Gemuenden demonstrate that the quality of teamwork can comprehensively be assessed by considering six facets of the collaborative work process: communication, coordination, balance of member contributions, mutual support, effort, and cohesion. The six teamwork quality facets embrace elements of both task-related and social interaction within teams (Cummings, 1978). The underlying proposition is that highly collaborative teams display behaviors related to all six teamwork quality facets. In teams with high teamwork quality, members openly communicate relevant information, coordinate their individual activities, ensure that all team members can contribute their knowledge to their full potential, mutually support each other in team discussion and individual task work, establish and maintain work norms of high effort, and foster an adequate level of team cohesion where team members maintain the group. Teamwork quality has been shown to be directly related to team performance (Easley et al., 2003; Hoegl & Gemuenden, 2001; Hoegl et al., 2004), and this effect becomes stronger as the innovativeness of the team task increases (Hoegl et al., 2003).

3. How team size affects teamwork

The size of a team has profound effects on several aspects of teamwork quality. First, the sharing of technical and coordinative information within the team becomes significantly more difficult as the number of team members increases (Zenger & Lawrence, 1989). As team size grows,

the complexity of the communication structure between all members increases dramatically. Fig. 1 illustrates this effect, showing the jump in the complexity of full communication structures in a team of 4 (6 links) versus a team of 10 (45 links). While the communication between all members becomes increasingly difficult, larger team size also creates a stronger need to coordinate the contributions from the various team members. The combination of these two effects highlights how teamwork becomes increasingly resource— and time— consuming as the team adds members. This exponential increase in interaction linkages may well have been a consideration in the assessments of team members and leaders in the aforementioned European automotive industry case. While adding one more member to a team of nine may seem insignificant, it does add substantially to the complexity of the team's communication structure.

Team size is an important determinant of the social loafing phenomenon, whereby individuals decrease their effort as the number of people in the group increases. Classic experiments by German psychologist Ringelmann at the beginning of the 20th century first documented a steep decrease of effort in men engaged in a tug of war (Kravitz & Martin, 1986). Where one man, on average, pulled about 63 kg, groups of three pulled 160 kg, and groups of eight pulled 248 kg. Hence, in groups of eight, the men put in about 49% of the effort they expended when pulling alone. Later experiments demonstrate that this loss in performance is, in fact, due to decreased effort, rather than coordination losses or other possible causes (e.g., Harkins & Petty, 1982).

Similarly, Bray et al. (1978) find that, as the size of problem-solving teams increases, so does the number of 'nonparticipating' members. This term refers to individuals that do not actively participate in the team's collaborative work. Bray et al. coin the term 'functional size', referring to those individuals that are contributing to the team's work. This illustrates that, as team size increases, it becomes more difficult for team members to contribute their knowledge, skills, and experience to their full potential, thus hindering an essential element of teamwork quality, i.e., the balance of member contributions. This, of course, is particularly critical in cross-functional or multidisciplinary teams, where the full contribution of all team members' diverse skills and knowledge is a key to team performance.

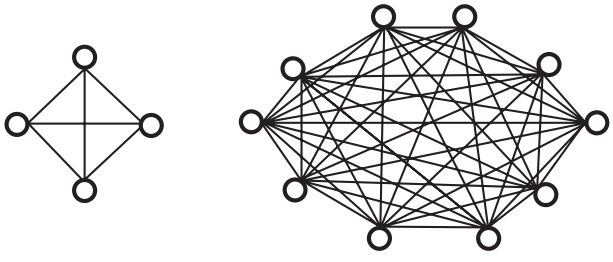

Figure 1 Large teams make it harder to communicate: full communication structure with 4 and 10 members.

4. There is no 'optimal' team size

Research evidence does not provide an absolute optimal team size in terms of a specific number, nor is there any conclusive indication of an absolute optimal range. As scholars have pointed out, the right team size will certainly depend on the work to be performed (Hackman, 1987), with some tasks requiring more team members than others do. By the same token, the above discussion highlights limitations to team size stemming from its effect on the collaborative work processes.

Therefore, team size must be determined with respect to both staffing requirements, deriving from the size of the project task, as well as teamwork requirements, deriving from task complexity and uncertainty (Hoegl et al., 2003). As projects get larger in size, thus may also the need to add personnel. Similarly, as the task is complex and uncertain, team members with diverse skill sets and knowledge bases must be included in the team to address task complexity, and the team must collaborate closely to integrate this knowledge.

Investigating the effects of team size based on data from 58 software development projects, it was found that the top five teams in terms of teamwork quality ranged in size from 3 to 6 members, with an average of 4.4 members. In contrast, the bottom five teams ranged in size from 7 to 9 members, with an average of 7.8 members. Moreover, teams of three members achieved, on average, 63% of the teamwork quality of the best team, while teams of nine members achieved, on average, 28% of the teamwork quality of the best team.

A very similar pattern, although to varying degrees, is present in all six teamwork quality facets (see Fig. 2). As such, these findings support the above-discussed notion that the smaller the team, the better the teamwork,

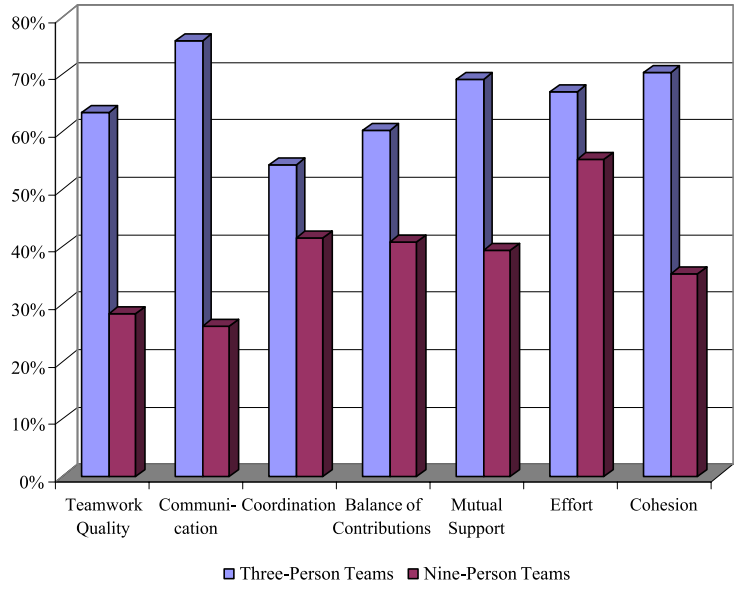

Figure 2 Smaller teams—better teamwork: average score for teamwork quality (and its six facets) for three- and nine-person teams as percent of the best team. Note: Teamwork quality is a higher-order construct made up of its six facets: communication, coordination, balance of member contributions, mutual support, effort, and cohesion.

although there was no indication regarding optimal team size; teams of three worked better than teams of six did, which, in turn, worked better than teams of nine did. In addition, given the lower teamwork quality of teams of 9, these results suggest that teams with 10 or more members cannot really be expected to perform high-quality teamwork. Very similar results in other studies involving product-development teams from different industries, such as automotive, medical devices, high-tech machine tools, customized software solutions, and plant construction, have been found, as well.

Given this evidence supporting the claims of scholars and the intuitions of practitioners, outlined are four ways to keep teams small while providing the breadth and depth of knowledge, as well as the necessary personnel capacity to successfully complete a given project.

5. Four ways to keep project teams small

(1) *Create a multiteam project*. Larger projects should be assigned to several small teams, rather than a single large one. Often, the structure of the project task is such that it can be split up into multiple subprojects assigned to smaller teams. For example, a software development endeavor taking 20 software engineers to complete in a given time should be split up into four teams of 5 each, rather than two teams of 10 or even one team of 20. The four teams would then be assigned modules of the overall software product, with their own quality, schedule, and budget objectives. These teams are the primary work units of such a temporary team-based organization (Mohrman et al., 1995). There may be an overall project leader facilitating the coordination between teams, or the teams themselves coordinate with each other (Hoegl et al., 2004).

(2) *Core team versus extended team*. Cross-functional teams often inflate in size unnecessarily because of departmental interests to be involved or the project leader's interest to keep everyone involved. Both of these considerations are valid, as cross-functional teams are designed to integrate different functional expertise on a certain project (e.g., product-development projects with the involvement of R&D, manufacturing, marketing, etc.). Hence, keeping all organizational units that are affected by an innovative process informed and involved is certain to ensure their commitment, particularly in later implementation phases (Olson et al., 2001). However, rather than having representatives from various organizational groups be included as formal team members, it is better to establish a core team of individuals that are

absolutely necessary for task completion to work directly and interactively together on the project. The remaining individuals outside of the core team may take roles of consulting or advisory members, who are informed on a regular basis and can provide input as needed. It is important, however, to clearly communicate these roles to ensure that everyone understands that it is the core team members who are responsible for the project's completion and who interactively work toward this common goal. The core team is the primary work unit with its resources, objectives, and commitments. The members of the extended team provide somewhat formalized informational links to other groups.

(3) *Define team-external contributions*. To keep teams small and functional, specific tasks and contributions toward project completion can be identified for team-external individuals or groups to provide, rather than including those individuals or groups within the team itself. For example, most every software product utilizes databases. Such databases are often standardized modules, for which technical interfaces to the other parts of the software can be defined. Moreover, the database specialist's expertise is not likely to support other task decisions or processes (important for product functionality, robustness, performance, and so on) beyond the database itself. Hence, this module lends itself to be outsourced to team-external individuals and groups. Rather than increase the software development team by a database specialist, it is better to define this as a team-external contribution that the team coordinates (Ancona & Caldwell, 1992).

(4) *Project phase-specific team members*. Often, projects have identifiable phases with different task requirements. Such is commonly the case in product-development projects, where the early concept phase requires creativity and conceptual thinking, while the design phase focuses on the actual development of initial prototypes, and later phases focus on product testing and production preparation (Hoegl et al., 2004). It is beneficial to keep team members on board during the project phases for which they are needed, rather than carrying them on the team throughout the whole project. As such, phase-specific members would join the team and leave it as needed, helping to achieve the project's objectives for a specific project phase.

6. Conclusion

Despite ample research evidence and the intuition of many practitioners that teamwork quality is lost in large teams, most organizations find it difficult to keep teams small. This work attempted to shed light on this widespread issue, explain why large team size hinders teamwork, and suggest four ways to keep teams lean and functional as collaborative work units.

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