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The role of star performers in software design teams

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Abstract

Purpose This study seeks to extend previous research on experts with mainly *ad hoc* groups from laboratory research to a field setting. Specifically, this study aims to investigate experts' relative importance in team performance. Expertise is differentiated into two categories (task functions and team functions) and the paper aims to investigate whether experts in task and team functions predict team performance over and above the team's average expertise level.

Design/methodology/approach Longitudinal, multi source data from 96 professional software design engineers were used by means of hierarchical regression analyses.

Findings The results show that both expert members in task functions (i.e. behavior that aids directly in the completion of work related activities) and the experts in team functions (i.e. facilitation of interpersonal interaction necessary to work together as a team) positively predicted team performance 12 months later over and above the team's average expertise level.

Research limitations/implications Samples from other industry types are needed to examine the generalizability of the study findings to other occupational groups.

Practical implications For staffing, the findings suggest that experts are particularly important for the prediction of team performance. Organizations should invest effort into finding "star performers" in task and team functions in order to create effective teams.

Originality/value This paper focuses on the relationship between experts (in task functions and team functions) and team performance. It extends prior research on team composition and complements expertise research: similar to cognitive ability and personality, it is important to take into account member expertise when examining how to manage the people mix within teams. Benefits of expertise are not restricted to laboratory research but are broadened to real world team settings.

Keywords Team performance, Team working

Paper type Research paper

Teamwork is a popular and widely used work design feature in today's organizations (Ilgen *et al.*, 2005; Kozlowski and Bell, 2003). This specifically applies to knowledge-intense and complex work such as software design (Hoegl and Parboteeah, 2006; Jones, 1996). By definition, work teams are social entities that

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interact at varying degrees of interdependency "to achieve specified, shared, and valued objectives" (Salas *et al.*, 1992, p. 4). One main research interest in team literature concerns the predictors of team performance. Whether teams are successful or not depends on team input variables (e.g. expertise, personality, team size) and on team process variables (e.g. information exchange, team climate, team affective tone, and conflict) (see, e.g. Kozlowski and Ilgen, 2006, for a review). In the present study, we focus on expertise as input variable since expertise has been considered to be one of the most important factors that predict team performance (Faraj and Sproull, 2000; Hackman, 1987; McGrath, 1984). Building on earlier research, we differentiate team members' expertise into task functions and team functions (Bales, 1950; Marks and Panzer, 2004; Stewart *et al.*, 2005) with task functions referring to behavior that aids directly in the completion of work-related activities, and team functions facilitating the interpersonal interaction necessary to work together as a team.

A considerable amount of research has emphasized the superior role of experts in ad-hoc groups from laboratory decision-making research (e.g. Bonner, 2004; Davis, 1973, 1996; Henry, 1995; Laughlin, 1980; Lorge and Solomon, 1955). However, there is almost no research on the role of experts in field settings (for exceptions see Bunderson, 2003; Faraj and Sproull, 2000; Sonnentag, 2001). Moreover, and most importantly, we are not aware of any study that has investigated whether experts significantly add to the prediction of team performance beyond the team's average expertise level. As a consequence, our understanding of the relative importance of experts in real-life teams is very limited. The present study was designed to close this gap. Building on existing research on the importance of experts in decision-making and social interaction (e.g. Bonner *et al.*, 2006; Laughlin and Ellis, 1986), we assume that the *best* team member in task functions (we will refer to this person in the following as the expert in task functions) helps to improve team performance over and above the average level of task functions within the team. Furthermore, accounting for the importance of team functions (Stevens and Campion, 1994) we argue that the *best* member in team functions (we will refer to this person in the following as the expert in team functions) can explain additional variance in team performance over and above the average level of team functions within the team.

Theoretically, it is important to determine how team members' expertise combine into team performance and whether experts are particularly important. Although it seems likely that expertise of team members is related to team performance, on closer inspection the issue becomes more complicated than it seems at first sight. It has been outlined that findings at the individual level can differ from findings at the team level (Kozlowski and Klein, 2000). Specifically, we argue that it is important to consider the individual performance level of an expert team member – above the average performance level of all team members – when predicting team performance. Analyzing experts' relative importance for overall team performance will broaden our understanding of team functioning. From a practical perspective, it is advantageous to learn more about the role of experts in teams as the results can suggest strategies for staffing. For example, if the expert member turns out to predict team performance over and above the mean level of expertise, this will suggest the importance of ensuring that all teams have at least one expert team member. However, if the expert member does not contribute significantly to team performance beyond the average team score, efforts should be made to select as many reasonably competent members as possible without keen concern over finding a single star performer. We test our assumptions in a longitudinal, multi-source field study in software design.

Expertise

Experts are defined as individuals "who are consistently able to exhibit superior performance for representative tasks in a domain" (Ericsson, 2006, p. 3). In teams, individuals can be experts in task functions and/or team functions. Task functions imply that someone is proficient in problem solving and knows how to tackle difficult technical problems whereas team functions indirectly contribute to the fulfillment of a team's task and goal requirements by directing and coordinating the efforts of other team members. Task and team functions can be considered as team roles which have been defined as "a set of behaviors that are interrelated with the repetitive activities of others and characteristic of the person in a particular setting" (Stewart *et al.*, 2005, p. 344). Previous research has considered both task and team functions to be necessary and important for effective teamwork (Stevens and Campion, 1994). We refer to those individuals in task and team functions as experts who are judged by other team members as showing the respective set of behavior most often.

Software design teams

Software design teams work on defined, specialized, and time-limited projects and often disband after they have finished a project (Sundstrom *et al.*, 2000). Software design is a complex task and encompasses different sub-tasks such as requirement analysis, software design, programming, testing, and debugging (Sonnentag *et al.*, 2006). In contrast with laboratory ad-hoc teams, software design teams exist for a longer time, often have to deal with new and unexpected challenges, and pursue meaningful goals such as the development of innovative and marketable products (Kiesler *et al.*, 1994, Stempfle and Badke-Schaub, 2002).

Expertise in task functions and team performance

For over 50 years, experts have attracted considerable research interest in decision-making research. Early research on decision-making in small cooperative problem-solving groups dealt with the question of how groups with different individual preferences come to a single collective group solution (e.g. Davis, 1973; Lorge and Solomon, 1955). Within this line of research, the "truth-wins approach" (Lorge and Solomon, 1955; Smoke and Zajonc, 1962) in which the correct answer is given when only one group member is correct was supported for tasks with strong demonstrability of correct solutions (Bonner *et al.*, 2006). Such tasks with high demonstrability comprise intellective tasks, which are widespread in real-world settings and incorporate (software) engineering team tasks (Laughlin, 1980). For intellective tasks, the best group member was found to be necessary and sufficient for best group outcomes (Bonner *et al.*, 2006; Henry *et al.*, 1996) and exerted twice as much influence on other group members (Bonner *et al.*, 2002). Experts' significance on decision making has also been shown to depend on the expert's centrality in the team, meaning that the total discrepancies between the expert and everyone else should not be too extreme; otherwise, expert's inputs are likely to be discounted (Davis, 1996).

Although no research explicitly addressed the relative importance of experts in real-world teams, following the previously outlined findings from laboratory decision making research we propose that experts in task functions significantly predict team performance beyond the team's average score in task functions for several reasons: Experts in task functions possess superior domain-specific knowledge (Sonnentag, 1998). From frequent interactions with numerous opportunities for showing task-proficiency, other team members are able to recognize who is most knowledgeable in task functions (Goodman and Shah, 1992; Hollenbeck *et al.*, 1995; Littlepage *et al.*, 1997). Consequently, other team members should contact the expert frequently for information search and information exchange. Status expectation theory (Berger *et al.*, 1972) also suggests that good performers are more central and will be considered more frequently as a source for information in team settings. According to status expectation theory, high status members (e.g. experts) are more actively involved in interpersonal interactions. Empirical findings support the assumption that experts are more engaged in the group's activities compared to other group members: Experts have been shown to mention and repeat more information, to be more central in groups, and to put emphasis on specific aspects of knowledge (Bunderson, 2003; Faraj and Sproull, 2000; Karakowsky and McBey, 2001). In accordance with these findings, we propose that the experts in task functions should significantly predict team performance beyond the average performance score in task functions.

> *H1.* The expert in task functions (Time 1) positively predicts team performance (Time 2) over and above the team's average expertise in task functions (Time 1).

Expertise in team functions and team performance

In addition to the importance of experts in task functions on team performance, we propose that experts in team functions who guide the team process are also essential to the productivity of the team. The importance of team functions is also stressed in Stevens and Campion's (1994) typology of generic and transferable knowledge, skills, and abilities (KSAs). The examples of teamwork as described by Stevens and Campion (1994) include conflict resolution, collaborative problem solving, goal setting, and performance management. In this research, we build on Stevens and Campion's (1994) emphasis on the relevance of teamwork behavior and focus on intellectual stimulation as one important aspect of team functions. In terms of Stevens and Campion's typology, intellectual stimulation can best be classified into the interpersonal category of teamwork KSAs. We chose intellectual stimulation as a team function because maintaining other team members' motivation is crucial for success in knowledge-intensive teams (and beyond) (Keller, 2006). For example, if a team does not reframe problems, question assumptions, and approach situations in new ways, a team's performance will suffer, especially in software design (Sonnentag *et al.*, 2006).

Intellectual stimulation is defined as a way of encouraging team members to be creative by questioning assumptions, reframing problems, and approaching old situations in new ways. New ideas and creative solutions are thereby elicited from other team members (Bass, 1985). Team members high in intellectual stimulation encourage other team members to think about problems more thoroughly and to address difficulties (Keller, 2006; Zaccaro, 2001). Intellectual stimulation implies that these team members are acting as a teacher and engaging in behaviors that are innovative and new and that go counter to existing norms (Pearce and Conger, 2003). Software development teams, which usually deal with innovative tasks that require radical and original ideas, should benefit from intellectual stimulation. Team members high in intellectual stimulation may provide new and inspirational ideas without necessarily having the technical skills to implement these ideas (Bass, 1985; Pawar and Eastman, 1997). This implies that the expert member in team functions is not also considered the expert member in task functions. Accordingly, research provides evidence that the expert member in task functions is seldom also the expert member in team functions (Bales and Slater, 1955). Teams often informally choose team members who offer not only guidance but also a mission and purpose to the team of their own (Wheelan and Johnston, 1996), and informal leadership emerges from negotiated roles with team members (Seers, 1989). Zaccaro *et al.* (1991) found that informal leaders are individuals who are very good at identifying other team members' needs and requirements. These informal leaders have been shown to significantly affect team activities as well as the structure and productivity of teams (Wheelan and Johnston, 1996). With respect to intellectual stimulation, which implies the expression of radical and original ideas, we assume that the expert member takes special responsibility for a team's success, as a duplication of team roles could have a negative effect on team performance (Blenkinsop and Maddison, 2007). Summarizing, we propose that the score of the expert member in team functions – here considered intellectual stimulation – should predict team performance beyond the team's average score in team functions.

H2. The expert in team functions (Time 1) positively predicts team performance (Time 2) over and above the team's average expertise in team functions (Time 1).

Present research

In our study, we investigate the importance of experts on team performance by means of both task and team functions. Our study contributes to the literature in several ways: First, our study extends previous research by analyzing the role of experts for overall team performance that goes beyond team members' average performance level. Second, when examining the role of experts in teams, we acknowledge Stevens and Campion's (1994) emphasis of teamwork behaviors and regard team functions separately from task functions in our study. Third, our study extends prior research on the role of experts in teams (e.g. Bonner *et al.*, 2006; Henry *et al.*, 1996) to a field setting, thereby increasing external validity.

To ensure that our hypothesis testing was as valid as possible, we controlled for some variables that have the potential to influence our results. First, we controlled for team meeting frequency, as the expert member's effect on team performance might vary depending on how often team members communicate with each other in meetings. Second, we controlled for gender composition since heterogeneous groups are often worse in identifying and incorporating team member expertise (Dovidio *et al.*, 1998; Thomas-Hunt *et al.*, 2003). Third, experts' relative importance with respect to team performance might depend on task type. Thus, following Steiner's taxonomy (1966, 1972), we controlled for team members' evaluations of the task as being additive, disjunctive, and conjunctive. Additive task type means that team performance is equal to the sum of the team's parts; disjunctive task type implies that team performance is best predicted by the team maximum (i.e. expert team members); and conjunctive task type means that the team minimum (i.e. the weakest performing team member) best predicts team performance. As software design tasks consist of a mix of these three task type (Stewart and Barrick, 2000), we controlled for all three task types.

Method

Overview

We tested our data by using a longitudinal survey approach with a time-interval of 12 months between measurement points. Questionnaires were sent by mail with a pre-stamped envelope that was returned to the researchers. We used multi-source data. Specifically, we assessed individual task performance by means of supervisor ratings, co-worker ratings of teamwork behavior (i.e. intellectual stimulation), and executive's ratings of team performance. We assured the participants of confidentiality and explained that the study was conducted in agreement with – but independent of – the company's management. As an incentive, companies were offered feedback after Time 1 (T1) and Time 2 (T2). These feedback sessions lasted about one hour, were conducted by members of the research team, and covered general topics such as project life cycles, types of teams, time management techniques, and practical issues in organizing team meetings. We did not present or discuss issues related to team composition, team roles, or team performance, as we were aware of the potential interference this could have had for our results. The main purpose of the feedback sessions was to motivate teams to participate in our study and to maintain personal contact between researchers and study participants over the one-year study period.

Sample

Data were gathered from 29 software development teams from 28 different organizations in Germany. At T1, we sent 224 self-report questionnaires to 29 teams. Of these questionnaires, 205 usable questionnaires from 29 teams were returned (response rate 91.5 per cent). At T2, 129 participants from 22 teams returned their questionnaires (62.93 per cent of the 205 persons who had participated at T1). Out of these, two teams had to be excluded from analyses because of time constraints, and two other teams because of a very low team response rate (less than 30 per cent of the team members). The final sample comprises 96 software engineers working in 20 teams. The following numbers refer to the remaining 20 teams included in this study. At T1, we sent out 101 questionnaires to the team members, 372 questionnaires to the co-workers, 132 questionnaires to the supervisors, and 20 questionnaires to the managing directors. Of these 625 questionnaires distributed, 532 were returned (response rate 85.12 per cent). At T2, we sent out 120 questionnaires to the team members, 348 questionnaires to the co-workers, 131 to the supervisors, and 20 to the managing directors. Of these 619 questionnaires, 519 were returned (response rate 83.84 per cent).

Drop-out analyses showed that participants who returned questionnaires at T1 and T2 did not differ from participants who did not participate at T2 with respect to supervisors' task functions ratings at T1 (M 6.32andSD 1.34 for respondents vs M 6.19, SD 1.10 for non-respondents), $F(1, 156)$ 0.242, *n.s.*, and co-worker ratings of team functions (M 3.58 and SD 0.47 vs M 3.66 and SD 0.60), $F(1, 168)$ 1.254, *n.s.*

The majority of participants were male (81.1 per cent). Mean age was 34.91 years (SD 7.96). On average, participants had 8.47 years of professional experience

(*SD* 7.39) and had worked with 3.62 different programming languages (*SD* 2.50) and 0.96 different design languages (*SD* 1.16). On average, team duration was 3.70 years (*SD* 2.56) and mean team size was 6.57 members (*SD* 3.47).

Measures

Expertise in task functions. Team members' individual expertise concerning task functions was rated by their supervisors at T1. Specifically, team leaders were instructed to assess each team member's performance by comparing this person with an average person on six job performance aspects suggested by Schuler *et al.* (1995) on nine-point scales ranging from 1 extremely below average to 9 extremely above average each (i.e. scientific and technical knowledge, innovation, problem solving, theoretical work, quality of customer relations, and technical service). Cronbach's alpha was 0.88. We had a score for the expert member in the team and computed a score for the average performance level within the team, not including the expert team member.

Expertise in team functions. To assess expertise in team functions, we used the sub-dimension intellectual stimulation from the German version of Bass' (1985) Multifactor Leadership Questionnaire (MLQ) developed by Felfe (2006). Co-workers were asked to evaluate the focal person on four items using five-point scales ranging from 1 never to 5 always. Co-workers evaluated if he/she "reexamines critical assumptions to question whether they are appropriate", "seeks different points of view when solving problems", "encourages others to consider problems from different perspectives", and "suggests new ways for how tasks can be accomplished". Cronbach's alpha was 0.82. For each team member we received one to nine questionnaires (*M* 5.26; *SD* 1.42). To extend our analysis, we needed to aggregate these measures for each target person. Therefore, it was necessary to determine the level of agreement between the respondents for each team member. We used r_{WG} – scores (e.g. James *et al.*, 1984) with r_{WG} representing the within-group interrater reliability. It is suggested that r_{WG} – scores should be higher than 0.70 for a "good amount of agreement" for most of the units under study (George, 1990, p. 110). Our mean r_{WG} – score for the intellectual stimulation scale was 0.89, hence aggregation was justified. Parallel to our procedure for task functions, we had a score for the expert member in the team and computed a score for the average performance level within the team, not including the expert member in team functions.

Team performance. Team performance was measured at T1 and T2. As a result of literature research (Brodbeck, 2001; Keller, 2001) and discussion with executives from different companies, six criteria for team performance were identified. Specifically, executives were asked to rate the respective team on technical quality, compliance with time schedule, compliance with cost schedule, number of innovations, coping with unexpected incidents, and quality of customer relations. Executives made ratings on five-point scales ranging from 1 below average to 5 above average. Cronbach's alpha was 0.82 (T1) and 0.80 (T2), respectively.

Control variables

Meeting frequency. Meeting frequency was assessed with one item by asking how often team meetings occurred (1 daily to 6 less than once a month). Individual answers were aggregated to the team-level. The mean r_{WG} – score was 0.78.

Gender composition. We computed the proportion of males in the teams.

Task type. We measured the disjunctive task type with four items and additive and conjunctive task type each with five items. Participants made ratings on five-point scales ranging from 1 do not agree at all to 5 absolutely agree. A sample item for disjunctive task type was "Team performance mainly depends on one best member", for additive task type "Each team member's performance is equally important for team performance", and for conjunctive task "Team performance suffers dramatically when there is only one weakly performing team member". Cronbach's alpha was 0.75, 0.71 and 0.77, respectively.

Results

Descriptive findings

Table I displays means, standard deviations, and zero-order correlations of the study variables.

Test of hypotheses

We tested our hypotheses by means of hierarchical regression analyses. *H1* predicted that the performance score of the expert team member in task functions (T1) positively predicts team performance (T2). Thus, we regressed team performance (T2) on individual task performance of the expert team member (T1). More specifically, in Model 1, we entered team performance, task type, the frequency of team meetings, gender composition, and the score of the expert member in team functions, and the average team score of the team in task functions, all taken at T1, as control variables. In Model 2, we entered the performance score of the expert member in task functions as our core predictor variable into the regression equation. Table II displays the results. As hypothesized, the performance score of the expert member in task functions positively predicted team performance at T2 (β $0.87, p < 0.05$). The performance score of the expert team member in task functions accounted for 18 per cent of variance in team performance at T2, even after controlling for team performance at T1, the score of the expert team member in team functions, and the team's average score in task functions. Thus, we found support for *H1*.

In *H2* we predicted that the team member with the highest score in team functions (i.e. intellectual stimulation) positively affects team performance at T2, beyond the prediction of the expert team member[1] in task functions as rated by the supervisor and the team's average score in team functions. The procedure of our analysis was analogous to that of *H1*. To test *H2*, in Model 1 at T1 we entered team performance, task type, the frequency of team meetings, gender composition, the score of the expert member in task functions, and the team's average score in team functions as control variables. Afterwards, in Model 2, we entered the score of the expert member in team functions into the regression equation (see Table III).

Analyses revealed that the expert member in team functions (i.e. intellectual stimulation) positively predicted team performance at T2 (β $0.44, p < 0.05$). The expert in team functions accounted for 12 per cent of variance in team performance, even after controlling for team performance at T1, the score of the expert team member in task functions and the team's average score in team functions. In sum, results for Hypothesis 2 were in line with our expectations[2].

Table I. Means, standard deviations, and zero-order correlations for the main study variables

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
Meeting frequency (Time 1)	3.31	0.76											
Task type (additive)	3.61	0.41	0.30	(0.75)									
Task type (conjunctive)	3.05	0.35	0.24	0.27	(0.77)								
Task type (disjunctive)	2.21	0.34	0.31	0.57**	0.08	(0.71)							
Gender composition[a]	81.08	13.76	0.05	0.33	0.21	0.28							
Expert team member in task functions (Time 1)	7.55	0.74	0.04	0.51*	0.06	0.40		0.26	(0.78)				
Average team score in task functions (Time 1)	6.06	0.84	0.25	0.52*	0.10	0.43*	0.06	0.79**	(0.86)				
Expert team member in team functions (Intellectual stimulation) (Time 1)	4.01	0.30	0.23	0.27	0.13	0.31	0.29	0.16	0.24	(0.83)			
Average team score in team functions (Intellectual stimulation) (Time 1)	3.57	0.23	0.37	0.26	0.05	0.28	0.25	0.01	0.23	0.54*	(0.86)		
Team performance (Time 1)	3.62	0.66	0.26	0.41	0.04	0.21	0.23	0.58**	0.64**	0.09	0.13	(0.82)	
Team performance (Time 2)	3.52	0.59	0.26	0.34	0.16	0.41	0.01	0.70**	0.60**	0.19	0.12	0.51*	(0.80)

Note: $n = 20$ teams; *$p < 0.05$. **$p < 0.01$; [a]proportion of males

Table II. Hierarchical multiple regression predicting team performance from the score of the expert team member in task functions

Variables (Time 1)	Team performance (Time 2) Model 1	Model 2
Team performance	0.25	0.03
Task type (additive)	0.16	0.23
Task type (disjunctive)	0.32	0.30
Task type (conjunctive)	0.13	0.28
Meeting frequency	0.11	0.24
Gender composition[a]	0.11	0.14
Expert team member in team functions	0.45^{+}	0.39^{*}
Average team score in task functions	0.45	0.10
Expert team member in task functions		0.87^{*}
R^2	0.61	0.79^{*}
ΔR^2	0.61	0.18^{*}

Note: $n = 20$; [a] proportion of males. $^{+}p < 0.10$. $^{*}p < 0.05$

Table III. Hierarchical regression predicting team performance from the score of the expert team member in team functions (intellectual stimulation)

Variables (Time 1)	Team performance (Time 2) Model 1	Model 2
Team performance	0.04	0.02
Task type (additive)	0.22	0.24
Task type (disjunctive)	0.24	0.28
Task type (conjunctive)	0.22	0.30
Meeting frequency	0.21	0.21
Gender composition[a]	0.17	0.16
Expert team member in task functions	0.74^{*}	0.85^{**}
Average team score in team functions	0.15	0.10
Expert team member in team functions		0.44^{*}
R^2	0.67	0.79^{*}
ΔR^2	0.67	0.12^{*}

Note: $n = 20$; [a]proportion of males; $^{*}p < 0.05$. $^{**}p < 0.01$

Discussion

The purpose of the present study was to examine how team members' input is related to team performance. Team members' input was differentiated in the two categories of task functions and team functions (Bales, 1950; Campion *et al.*, 1993; Stevens and Campion, 1994). Building on existing research from social and organizational psychology on the role of experts in decision-making and social interactions (e.g. Bonner *et al.*, 2006; Davis, 1973, 1996; Henry, 1995, Laughlin, 1980; see Kerr and Tindale, 2004; for a review), we assumed that the expert member in task functions contributes to team performance over and above the team's average level of task functions. Furthermore, accounting for the importance of team functions (Stevens and Campion, 1994) we argued that the expert member in team functions (i.e. intellectual stimulation) can explain additional variance in team performance after accounting for the expert member in task functions and the team's average level of team functions.

The data were supportive regarding our assumptions that both in task functions and team functions, experts are particularly important for the prediction of team performance. The experts were able to contribute to team performance beyond the average performance level in the team. Our study extended existing research on the relevance of experts in teams, which was mainly conducted in the laboratory with ad-hoc student groups (e.g. Henry, 1995; Hollenbeck *et al.*, 1995) to a field setting with teams that interact for a much longer time and have the opportunity to negotiate team roles over time.

This study broadens our knowledge of the functioning of teams in organizational settings. In accordance with team role research (Bales, 1950; Stevens and Campion, 1994), our study shows that it is useful to differentiate team member input into the two categories of task and team functions. Both the performance level of experts in task functions and of experts in team functions explained variance in team performance beyond the team's average level of task/team functions and beyond the expert performance level in the other respective expertise category. Team functions might be interpreted as an additional layer of requirements, compared with individual task completion that have to be met in team settings, and might harmonize the dynamics of the team so that any individual is able to work together effectively with others (Cannon-Bowers *et al.*, 1995; Cooke and Kiekel, 2001; Cooke *et al.*, 2003). We found that the expert member in task functions was never also the expert member in team functions. Our study adds to the recently growing research interest in team roles (Davies and Kanaki, 2006; Humphrey *et al.*, 2009) and extends earlier research on team composition (Bell, 2007) by suggesting that one needs to specifically consider expert members beyond the averaged team expertise level when examining team performance.

Limitations and implications for research and practice

The present research has limitations that leave prospects for further investigation. First, participants from our study all came from the same industry type. Although we do not assume specifics concerning participants in software design, samples from other industry types are needed to examine the generalizability of the study findings to other occupational groups or to virtual work groups (Curseu *et al.*, 2008). Second, with respect to team functions, we investigated intellectual stimulation as one example of interpersonal teamwork behavior (Stevens and Campion, 1994). Although intellectual stimulation proved to play an important role in improving team performance, future research should extend the current findings by broadening the focus of teamwork behavior to other interpersonal KSAs (e.g. conflict behavior) and self-managing KSAs (e.g. goal-setting). Third, future research should replicate findings and investigate the importance of expertise on team performance in relation to other input variables. It is conceivable that interactions exist between expertise and personality. Fourth, the role of team process variables (e.g. team affective tone, team dynamics) is also worth further examination. Fifth, future research should investigate the role of task type as a moderator. It is conceivable that experts play a much more important role in disjunctive tasks compared to additive or conjunctive tasks. For other tasks than software design tasks results might be more positive in disjunctive tasks, slightly positive or neutral in additive tasks and may even be negative in conjunctive tasks.

Our results suggest a new way of conceptualizing team member input. Beyond the use in previous research of the important combination of several team member inputs (e.g. mean score, variability, maximum, minimum) (Bell, 2007), our study suggests that using a combination of the mean score approach and the maximum score approach (i.e. expert approach) to determine what makes teams effective is promising. Thereby, we can determine team members' relative importance for team performance. Moreover, our findings provide guidance for team staffing. Organizations should know about the relevance of different types of expertise in teams (i.e. task and team functions) and invest efforts into finding "star performers" versus finding as many competent members as possible. For example, managers could use team role tests in team member selection (Mumford *et al.*, 2008).

In short, the present research provides important evidence that the positive relationship between expertise and performance is not restricted to laboratory research but can also be identified in organizational settings. Team performance particularly benefits from experts with a high level of task proficiency as well as from experts with a high level of leadership and as a provider of new and stimulating ideas. Considering expert team members aside from the average team has added substantially to our knowledge and understanding of the predictors of team performance.

Notes

1. In no cases was the formal leader also the expert team member.
2. We included the distributions of team members' individual performance (task and team functions), the score of the second expert member, as well as the absolute difference scores between the expert and second expert member (task and team functions) as predictors of team performance (T2). We also included the score of the formal leader in intellectual stimulation as a predictor for team performance (T2). None of these variables were significant. Results are available on request from the first author.

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Further reading

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