CHAPTER 4
Perceived Expertise Dissimilarity and Complementarity: Dyad-level Antecedents and Team-level Consequences

Introduction

Tom is an electrotechnical engineer who works in a research and development team of a large organization. In this team, it is necessary that Tom combines and applies his expertise with his team members to develop an application for a new and innovative line of copiers and printers. He cooperates with Michael, a chemist, and John, a physicist, and experiences that working with Michael is much more effective than working with John. In particular, he experiences that the expertise of Michael is much more useful than the expertise of John for completing the team task. He wonders why this is the case.

The question of why some teams with members who have different expertise cooperate more effectively than other teams has also reached and racked the minds of organizational researchers. Traditionally, scholars have tried to answer this question by investigating how objective proxies of team members’ differences in types of expertise are related to the performance of teams. The accumulated evidence suggests that differences in types of expertise can lead to effective team performance when, for example, task environments are non-routine, when tasks require that team members interact with each other, and when task and goal interdependence are congruent (Hambrick, Cho, & Chen, 1996; Murray, 1989; Pelled, Eisenhardt, & Xin, 1999; Van der Vegt, Van de Vliert, & Oosterhof, 2003). These are important pieces of knowledge. Nonetheless, answering Tom’s question with this approach is difficult because he and his team mates are equally different in type of expertise, operate in the same task environment, and perform the same joint tasks. So, the question remains: why does Tom experience differences in effectiveness between working with Michael and John?

Recently, scholars have suggested that expertise differences involve more than just differences in types of expertise (Van der Vegt, Bunderson, & Oosterhof, 2006).
Specifically, they have recognized that groups such as research and development teams (R&D teams) are composed of members who not only differ in type of knowledge and ability but also in level of knowledge and ability (cf., Allen, 1997; Pelz & Andrews, 1966). Consequently, it may be that the effectiveness of Tom’s work relationships depends on differences in both types and levels of expertise. Moreover, it may be that type-differences and level-differences in expertise have interacting consequences for the effectiveness of work relations (cf., Harrison & Klein, 2007).

In addition, scholars have argued that it matters whether and to what extent team members perceive their differences in expertise for understanding how they react to them. Indeed, paying attention to perceptions of expertise differences is important because objective differences may be more or less salient to an individual (Lawrence, 1997; Randel, 2002). Moreover, differences in expertise can be perceived as more or less useful or complementary for task completion (e.g., Glaman, Jones, & Rozelle, 2002). This may help to diagnose Tom’s problem. His experience of the work relations with Michael and John as more and less effective, respectively, may well depend on the extent to which he actually perceives expertise dissimilarity, and on the extent to which he perceives that Michael’s and John’s dissimilar expertise complements his own expertise.

This study is inspired by, and builds on, these considerations. We investigated how objective differences in types and levels of expertise are related to perceptions of both expertise dissimilarity and expertise complementarity. Research into the antecedents of both group characteristics is important in view of the ambiguity surrounding the construct of expertise complementarity. That is, although researchers recognize that for effective collaboration team members need to possess different but complementary expertise (e.g., Levine & Moreland, 2004), it is unclear when team members simply and solely have different expertise and when they additionally have complementary expertise. We propose that expertise dissimilarity and expertise complementarity are related yet different concepts that need to be disentangled in order to really make scientific progress in designing effective teams. By investigating the antecedents of perceived expertise dissimilarity and complementarity, we are able to demonstrate the uniqueness of the two crucially important phenomena.

Additionally, we investigate how both perceived expertise dissimilarity and perceived expertise complementarity are related to team performance. This is also crucially important given the central role scholars have ascribed to expertise complementarity for the performance of teams in which members need to cooperate with others who have different expertise (e.g., Hinds, Carley, Krackhardt, & Wholey, 2000; Jackson, 1996; Krishnan, Miller, & Judge, 1997; Levine & Moreland, 2004). With investigating the consequences of both kinds of expertise perceptions we are
able to test the viability of this common assumption. Specifically, we will argue that alignment of perceptions of expertise dissimilarity and complementarity can explain why some R&D teams are better able to cooperate effectively than others. We test our hypotheses using data on 1077 unilateral work relations from 69 R&D teams in a Dutch organization operating in the field of digital printing and document management.

Theoretical Background

Defining Perceived Expertise Differences

Perceived expertise dissimilarity. Two conceptualizations of expertise are found in the organizational literature. The first focuses on domains or the types of knowledge and abilities individuals possess (e.g., Dougherty, 1992; Dahlin, Weingart, & Hinds, 2005). The second focuses on the amount of expertise or the level of knowledge and abilities individuals possess (e.g., Faraj & Sproull, 2000; Hollenbeck, Ilgen, Sego, Hedlund, Major, & Phillips, 1995). Building on these conceptualizations of expertise, we define expertise dissimilarity as differences between team members in types of knowledge and abilities, levels of knowledge and abilities, or both. Accordingly, perceptions of expertise dissimilarity refer to the experience of differences in types of knowledge and abilities, levels of knowledge and abilities, or both. As such, our definition echoes Harrison and Klein’s (2007) assertions that diversity involves both variety (i.e., differences in types) and disparity (i.e., differences in level).

Perceived expertise complementarity. As mentioned above, when scrutinizing the topic of expertise differences in teams, one regularly comes across the term expertise complementarity (Hinds et al., 2000; Jackson, 1996; Krishnan et al., 1997; Levine & Moreland, 2004). It is argued that when team members have complementary knowledge and abilities, team performance may be higher than when team members have similar knowledge and abilities. Although juxtaposing expertise complementarity with expertise similarity makes clear that the concept involves differences in expertise, it is unclear in what quality complementarity diverges from plain dissimilarity in expertise. We propose that perceived expertise complementarity involves perceiving how the different expertise of oneself vis-à-vis other team members can be useful or even necessary for the completion of personal or team tasks (cf., Glaman et al., 2000; Hinds et al., 2000). We further propose that perceived expertise complementarity occurs when team members are different in types of expertise and similar in level of expertise. In addition, they need to have sufficient work experience to know how the expertise of other team members matches the lacks in one’s own expertise. Below, we discuss in more detail the distinct qualities
of expertise dissimilarity and expertise complementarity.

**Antecedents to Perceptions of Expertise Dissimilarity**

Many contemporary R&D organizations employ project teams in which members who differ in expertise cooperate toward the completion of a specific project (Katz & Allen, 1997). For managers in these environments, demographic information on an individual’s education is often a key criterion for assigning members to project teams because it offers a good indication of someone’s expertise (Reagans, Zuckerman, & McEvily, 2004). In particular, managers use this information because it offers easily available data regarding the type of expertise team members have available for teamwork (e.g., expertise regarding electrotechnical engineering, chemistry, physics, and the like), and the level of expertise team members possess (e.g., Bachelor’s degrees and Master’s degrees).

As a result of this focus on education for assigning members to teams, it is likely that members of R&D teams also use education as an obvious indicator to gauge the expertise of the other team members (cf., Van der Vegt & Bunderson, 2005). Furthermore, unlike other demographic characteristics, education may be a meaningful indicator for members of R&D teams because it is highly job-related and directly relevant for the performance of these teams (e.g., Jackson, May, & Whitney, 1995). Consequently, we suggest that for members of R&D teams, differences in educational background and educational level form the basis for perceiving differences in expertise. Hence,

**Hypothesis 1:** Differences in educational background and educational level are positively related to perceptions of expertise dissimilarity.

**Antecedents to Perceptions of Expertise Complementarity**

Once team members perceive that the others’ expertise is dissimilar from their own expertise, they also form expectations about how others’ expertise may contribute to the achievement of personal and team tasks (Berger, Rosenholtz, & Zelditch, 1980; Levine & Moreland, 1990). Scholars have argued that these expectations of contribution to achievement are based on salient personal characteristics that signal whether and to what extent a person can offer valuable resources such as an individual’s education (e.g., Bunderson, 2003). Based on this perception-expectation link, we expect that perceived differences in educational background and educational level also form the basis for experiencing expertise complementarity. Specifically, we will set forth reasons for predicting that combinations of these two educational manifestations result in perceptions of how the different expertise of oneself vis-
à-vis other team members can be useful or even necessary for the completion of personal or team tasks.

As argued earlier, education is not only indicative of the domain in which a team member operates but also of the extent to which that individual is an expert. Research suggests that for that reason education also evokes perceptions of differences in status or social prestige (Bunderson, 2003; McPherson, Smith-Lovin, & Cook, 2001). Specifically, members with a lower level of education may be awarded less status than members with a higher level of education (cf., Cohen & Zhou, 1991). Consequently, coordinating and cooperating team members may not only experience differences in types of expertise but also differences in status or prestige.

We assume that to the extent that team members differ more in terms of types of expertise, they experience that the different types of expertise may be of value to task completion. Accordingly, they experience more complementarity in expertise. However, we suggest that these perceptions of expertise complementarity occur only to the extent that team members are more similar in levels of expertise. Specifically, the more team members are dissimilar in levels of expertise, the less they may experience respect for, and appreciation of, one another’s unique potential contribution to the team task because of the imbalance in status (cf., Dovidio, Gaertner, & Validzic, 1998). This may cause team members to have less placid work relations (Rusbult & Van Lange, 2003), and to be reluctant to easily confide to one another (Marsden, 1988). Team members may literally experience that they are not “on the same level”, that it is difficult to communicate and cooperate across levels, which hampers perceptions of expertise complementarity.

**Hypothesis 2:** Team members will perceive more expertise complementarity to the extent that they are different in educational background and similar in educational level.

**The Influence of Work Experience on Perceived Expertise Complementarity**

In a way Hypothesis 2 is naïve as it neglects that exactly the same combination of dissimilarities in educational background and similarities in educational level can be more or less effective depending on the tasks and task-goal connections in the team. It takes time to acquire knowledge about the tasks and goals of a specific R&D teams and about one’s own role in this team in order to then be able to perceive degrees of expertise complementarity. Indeed, based on organizational socialization theory (e.g., Rollag, 2004; Van Maanen & Schein, 1979), we propose that for complementarity perceptions to occur, team members need to have sufficient work experience in order to correctly perceive what kinds of expertise are important to perform effectively on
the job. Put differently, we propose that work experience shapes the interactive effect of differences in educational background and in educational level on perceptions of expertise complementarity.

When team members do not have much work experience, differences in educational background and educational level may not or hardly be related to perceptions of expertise complementarity. Their inexperience limits their understanding of how the different expertise of others can contribute to attaining personal or team goals, with the consequence that they are less appreciative of others’ expertise, and experience less expertise complementarity. To the extent that team members have more work experience, they get a better view on the goals that are important for effectively working on tasks in R&D teams. They develop a better understanding of *which* knowledge and abilities are relevant or even necessary for effectively performing tasks and attaining goals. In addition, more work experience may result in more comprehension of *how* one’s own expertise can be combined with others’ expertise to cooperate effectively. As a result, team members develop more appreciation for how others’ expertise can help and complement their own expertise in completing personal or team tasks. Hence,

**Hypothesis 3:** The more work experience team members have, the stronger the relationship between differences in educational background and difference in educational level, and perceptions of expertise complementarity.

**Perceived Expertise Dissimilarity, Perceived Expertise Complementarity and the Performance of Teams**

We argued that perceptions of expertise dissimilarity and of expertise complementarity are independent and conceptually distinct constructs. Implicitly, many organizational researchers have also assumed that expertise dissimilarity and expertise complementarity are distinct characteristics by postulating that effective teams need to be composed of members who have *different but complementary* expertise (e.g., Hanna & Walsh, 2002; Harrison, Hitt, Hoskisson, & Ireland, 2001; Levine & Moreland, 2004). On closer consideration, they seem to advocate that expertise dissimilarity and expertise complementarity in and of themselves are insufficient for predicting team performance, and that expertise complementarity is a necessary requirement for determining whether and to what extent expertise differences can lead to effective team performance.

In line with this more implicit construal, we explicitly propose that perceived expertise dissimilarity and perceived expertise complementarity jointly rather than separately predict team performance. Perceptions of expertise dissimilarity may not
be related to team performance because in and of themselves they are not informative of whether, and to what extent, these differences are relevant for attaining personal or team goals. Analogously, perceptions of expertise complementarity may not be related to team performance because by themselves these perceptions are not informative of whether, and to what extent, team members actually perceive to differ in expertise. In concert, however, perceived expertise dissimilarity and perceived expertise complementarity may be indicative for team performance. When team members perceive that their expertise differences are less complementary, intrateam relations are characterized by less effectiveness because the differences are perceived as less useful for the completion of tasks and the attainment of goals. As a consequence, team members invest less in developing a work relationship and teams will be less effective. In contrast, when team members perceive that their expertise differences are more complementary, they believe that differences are useful and can help attain personal or team tasks, and are willing to invest more in cooperative work relations, which promotes the performance of teams. Hence,

**Hypothesis 4:** Within-team alignment of perceptions of expertise dissimilarity with perceptions of expertise complementarity will be positively associated with team performance.

**Method**

**Sample and Procedure**

Questionnaire data were collected in R&D teams of a Dutch multinational operating in the field of digital printing and document management. This organization adopted a matrix structure (Katz & Allen, 1997) in which departmental managers assigned individuals on the basis of their educational background and educational level to specific project teams. These project teams were supervised by a project manager who was charged with the responsibility of integrating efforts toward the development of new products and technologies including hardware system products (copiers, printers, and scanners), software products (e.g., web based document management), and related materials (e.g., toner, inks, and photoconductors). In order to perform their work, team members were required to interact frequently, share resources and information, and coordinate efforts toward the accomplishment of joint goals.

In cooperation with the human resources department and the departmental managers, we contacted the project managers, promising feedback if they would participate. If they agreed to participate, we asked that they inform their team members about the study. After receiving information from their managers, we sent
individual team members e-mails in which we explained the nature of the study, that participation was voluntary, and that responses would be confidential and used for research purposes only. If they agreed to participate, they could click on a hyperlink leading them to an electronic survey.

The data from the electronic survey were collected by means of a round-robin design (Warner, Kenny, & Stoto, 1979). In a round-robin design, each team member rates, and is rated by, every other member. This means that, in a team of four individuals, each member has to rate three other team members, which results in twelve relationship documentations. These data were stored in a pass-word protected area on the university-server. After gathering data from team members, we also interviewed project managers of participating teams and asked them to fill out a survey regarding the performance of these teams. The data of these surveys were returned directly to the researchers.

We contacted 374 members from 76 teams. Of these 374 members 291 members completed a questionnaire (77.81%) coming from 69 teams (90.79%). This resulted in a total of 1077 out of a possible 1208 (89.16%) directed relationships. The teams ranged in size from 3 to 11 members (M = 6.39, SD = 2.08). All of the respondents were Dutch, and 99% was male. The mean age was 37.14 years (SD = 9.08), mean organizational tenure was 11.52 years (SD = 9.28), and mean team tenure was 1.99 years (SD = 3.56). There was substantial variation in educational background (35.0 percent electrotechnicians; 24.2 percent mechanical engineers; 18.7 percent computer scientists; 12.0 percent physicists; 15.6 percent chemists; and .4 percent had an other background) as well as in educational level (56.3 percent bachelor’s degree; 30.9 percent master’s degree; 12.8 percent intermediate vocational educational degree).

**Measures**

**Educational background and educational level.** Information regarding the educational background and educational level was based on archival data obtained from the human resources department. For the dyadic differences in educational background and educational level, categorical variables were created. Specifically, regarding educational background, a code of 0 indicated that two team members were similar, whereas a 1 indicated that two team members differed. Similarly, regarding educational level a 0 indicated that team members had the same level of education; a 1 indicated that two team members differed.

**Work experience.** We consulted the human resources department for help in identifying a meaningful indicator of work experience. Based on this consultation, we decided to use archival data on individuals’ organizational tenure because it elegantly reflected the number of years of experience in performing tasks within
their dominant domain of specialization such as computer science, mechanical engineering, physics, chemistry, etc. (M = 11.52 years, SD = 7.38). Contrary to dyadic differences in educational background and educational level, organizational tenure was an individual-level variable.

**Perceived expertise dissimilarity.** Perceived expertise dissimilarity was measured using Likert-type scales (1 = strongly disagree, 7 = strongly agree). The items were: “X has another knowledge background than I have”, “X has a different expertise than I have”, and “X has other skills than I have”. Instead of asking every individual team member to rate all team members in detail, we reduced the respondents’ burden by letting them fill out the whole scale for only one randomly selected team member (Cronbach’s alpha’s of the whole scale was .83). For all the other team members, respondents answered only a single item: “X has a different expertise than I have”. The Pearson correlation between the single item and the combined rest of the scale was .79 (p < .001).

**Perceived expertise complementarity.** Similarly, perceived expertise complementarity was measured with the following items: “X complements me in things I am not good at”, “Regarding knowledge and abilities, X and I complement each other”, and “X and I compensate for our weaknesses” (Cronbach’s alpha of the whole scale was .76). For all the other team members, respondents answered the item “Regarding knowledge and abilities X and I complement each other”. The Pearson correlation between the single item and the combined rest of the scale was .73 (p < .001).

**Team performance.** We asked supervisors to rate each team on the following criteria deemed relevant by the human resources department: quality of work, speed of work, and overall performance (1 = bad; 10 = exceptional; Cronbach’s alpha = .83).

**Control variables.** For the analyses at the dyadic level, we controlled for age, age dissimilarity, and team size as research has suggested that these variables may influence intrateam processes (e.g., Van der Vegt et al., 2006). Age dissimilarity was obtained by calculating the Euclidian distances between every possible team member pair (e.g., Tsui, Egan, & O’Reilly, 1992). In addition, we controlled for familiarity as the awareness of expertise differences can depend on the time team members have known each other.

At the team level of analysis, we controlled for educational background diversity, educational level diversity, age diversity, organizational tenure diversity, team tenure diversity, and team size. The coefficient of variation (Allison, 1978) was used for the continuous demographic variables of team tenure, organizational tenure, and age. The Blau (1977) index was used for educational background and educational level.

Information regarding education, and age was obtained from the human resources
department. Team size was assessed in cooperation with the project manager. Finally, team tenure and familiarity were obtained by asking team members how many months they had worked in the team (M = 23.89, SD = 3.56), and how well they knew a specific team member (1-item Likert-type scale, 1 = not at all, 7 = very well; M = 4.83, SD = 1.30).

Results

Descriptive Statistics
The means, standard deviations, and intercorrelations of variables are presented in Table 4.1. As can be seen, differences in educational background and educational level were positively related to perceptions of expertise dissimilarity ($r = .19, p < .001$, and $r = .16, p < .001$, respectively). In addition, differences in educational background were positively related to perceived expertise complementarity ($r = .07, p < .05$). Organizational tenure was positively related to perceived expertise dissimilarity ($r = .11, p < .01$). Finally, the alignment between perceived expertise dissimilarity and perceived expertise complementarity had a positive relationship with team performance ($r = .13, p < .01$).

Perceived Expertise Dissimilarity
Regression results for models with perceived expertise dissimilarity as the dependent variable are summarized in Table 4.2. In Hypothesis 1 we argue that differences in educational background and in educational level will be positively related to perceptions of expertise dissimilarity. Entering the control variables revealed that familiarity was negatively related to perceived expertise dissimilarity ($b = -.13, p < .01$). As expected, after entering the control variables, the results revealed that differences in educational background and in educational level were positively related to perceived expertise dissimilarity (see Model 2: $b = .63, p < .001$; and $b = .40, p < .001$, respectively)7.

Perceived Expertise Complementarity
Regression results for models with perceived expertise complementarity as the dependent variable are summarized in Table 4.3. Hypothesis 2 predicts that there will be a two-way interaction between differences in educational background and educational level such that when team members have different backgrounds

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7 In line with the predictions for perceived expertise complementarity put forward in Hypothesis 3, we also tested whether organizational tenure would have an influence on the main effects for perceived expertise dissimilarity. As can be seen in Table 2, we did not find any significant two-way interactions (see Model 3) or three-way interactions (see Model 4).
### TABLE 4.1

**Descriptive Statistics and Pearson Zero-Order Correlations Among the Study Variables**

| Variable                                      | M   | SD  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |
|-----------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. Age                                        | 37.14 | 9.08 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2. Gender                                     | .10 | .04 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3. Age dissimilarity                          | 9.11 | 7.38 | .25** | .09** | .04 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4. Gender dissimilarity                       | .05 | .23 | .06 | .42** | .09** |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5. Team size                                  | 6.39 | 2.08 | -.05 | .04 | -.07** |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6. Team tenure                                | 23.89 | 3.56 | .01 | .09** | .04 | -.03 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 7. Organizational tenure                      | 11.52 | 9.28 | -.03 | .22** | .05 | .05 | .12** |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 8. Familiarity                                | 4.83 | .30 | .04 | -.04 | -.07** | .00 | .00 | .04 | .06 |     |     |     |     |     |     |     |     |     |     |     |
| 9. Difference educational background          | .45 | .50 | .06 | .00 | -.04 | -.13** | -.01 | -.05 | -.02 |     |     |     |     |     |     |     |     |     |     |     |
| 10. Difference educational level              | .51 | .50 | .06* | .01 | .13** | .01 | -.04 | .03 | .08* | -.12** | -.03 |     |     |     |     |     |     |     |     |     |
| 11. Perceived expertise dissimilarity (PED)   | 5.24 | 1.39 | .03 | .08** | .02 | -.06* | -10** | .11** | -.08 | .19** | .16** |     |     |     |     |     |     |     |     |     |
| 12. Perceived expertise complementarity (PEC) | 4.95 | 1.20 | -.06 | -.04 | -.04 | .02 | -.05 | .00 | .30** | .07* | -.10 | .15** |     |     |     |     |     |     |     |     |
| **Team level**                                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 13. Age diversity                             | .22 | .08 | -.02 | .08* | .33** | .20** | .07** | .06 | -.04 | -.05 | -.10** | .04 | .01 | -.06 |     |     |     |     |     |     |
| 14. Gender diversity                          | .07 | .14 | .15** | .23** | .25** | .52** | -.07* | .08** | .13** | -.02 | .01 | .05 | .04 | -.03 | .39** |     |     |     |     |     |
| 15. Educational background diversity          | .43 | .15 | .22** | .01 | -.02 | -.03 | .23** | .02 | -.14** | -.03 | .54** | -.02 | .03 | .01 | -.17** | -.03 |     |     |     |     |
| 16. Educational level diversity               | .36 | .21 | -.14** | -.02 | .12** | .02 | -.20** | -.03 | .27** | -.03 | -.13** | .31** | .02 | .00 | .09** | .06* | -.20** |     |     |     |
| 17. Alignment between PED and PEC             | .21 | .33 | -.02 | .01 | -.05 | -.02 | -.11** | -.06 | -.02 | -.01 | .01 | .06 | .05 | .11** | .08** | .03 | .03 | .18** |     |     |
| 18. Team performance                          | 6.97 | .97 | -.04 | .03 | -.05 | .10** | -.17** | .03 | -.02 | -.07** | .04 | -.21** | .02 | .03 | .07* | .22** | -.10 | -.12** | .16** |     |     |

**Note:**

* Female = 2

b Similar = 0; Dissimilar = 1

c Within-team correlation between Perceived expertise dissimilarity and Perceived expertise complementarity

N = 1077

* p<.05; ** p<.01; *** p<.001
but similar levels they will experience the most expertise complementarity. After entering the control variables in Model 1, the results showed that familiarity was positively related to perceptions of expertise complementarity ($b = .39$, $p < .001$). The addition of differences in educational background and in educational level in Model 2 yielded a significant increase in explanatory power ($\Delta R^2 = .02$, $p < .01$) and showed that both were positively related to perceived expertise complementarity ($b = .33$, $p < .001$, and $b = .19$, $p < .05$, respectively). Adding the two-way interactions in Model 3 did not increase the explanatory power. So, Hypothesis 2 was not confirmed.

However, the three-way interaction in Model 4 cast a different light on the absence of a two-way interaction effect between differences in educational background and in educational level. We found a negative and significant coefficient for the complex interaction between differences in educational background, educational level and organizational tenure ($b = -.47$, $p < .001$). In support of Hypothesis 3, differences in educational background and educational level were related to perceived expertise complementarity when organizational tenure was high ($b = .19$, $p < .001$). Specifically, the simple slope tests revealed that in this situation perceived expertise
Complementarity was highest when team members were different in educational background but similar in educational level (see Figure 4.1).

**Perceived Expertise and the Performance of Teams**

We tested whether teams in which team members’ perceptions of expertise dissimilarity aligned with their perceptions of expertise complementarity performed better. To that end, we first computed the within-team correlation between a team member’s perception of expertise dissimilarity and the same team member’s perception of expertise complementarity. Considering that the teams in our sample ranged from 3 to 11 members, this measure was based on a minimum of 6 (3 members rating relations with 2 other members) and a maximum of 110 observations (11 members rating relations with 10 other members). The within-team correlation ranged from -.69 to .82 with a mean of .21 and a standard deviation of .33. Subsequently, we regressed this correlation on supervisor ratings of team effectiveness for all of the teams in the sample (a team-level of analysis). Table 4.4 shows that after controlling for diversity in educational background, diversity in educational level, age diversity,
tenure diversity, team tenure diversity, gender diversity, and team size, teams performed better to the extent that team members perceived differences in expertise as more complementary ($b = .27, p < .05$).

**TABLE 4.4**

**Results of Regression Analysis for Team Performance**

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<th>Step</th>
<th>Model</th>
<th>Variable</th>
<th>Model 1</th>
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<td>Alignment between Perceived expertise dissimilarity &amp; Perceived expertise complementarity</td>
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N=69

* $p<.05$

* Within-team correlation between Perceived expertise dissimilarity and Perceived expertise complementarity
Discussion

Our objective in this chapter was to investigate the dyad-level antecedents and team-level consequences of perceptions regarding expertise dissimilarity and expertise complementarity. We assumed that members of R&D teams would use other members’ educational background and educational level as an indicator for type and level of expertise. Moreover, we examined how the alignment of these dyadic perceptions was related the performance of R&D teams. Below, we present our key findings and the theoretical implications. In addition, we reflect on the study’s strengths and limitations, and present potential directions for further research.

Our investigation into the antecedents of expertise perceptions in R&D teams showed that team members use objective information as a basis for perceiving interpersonal differences in expertise. That is, we found that the pattern of the relation between differences in educational background and educational level differed for perceived expertise dissimilarity and perceived expertise complementarity. With regard to perceived expertise dissimilarity, both educational background and educational level differences predicted whether team members perceived to be dissimilar in expertise from others. In contrast, concerning perceived expertise complementarity our results revealed that differences in educational background and educational level had interacting consequences together with organizational tenure. In particular, our results yielded that team members perceived more expertise complementarity with others who differed in educational background and were similar in educational level, but only for team members with much organizational tenure.

Taken together, our investigation into the antecedents suggests that perceived expertise dissimilarity and perceived expertise complementarity are related yet different constructs. They are related because both types of perceptions involve differences in types and levels of expertise and, thus, both involve perceptions regarding differences in expertise. They are different, however, in that perceived expertise dissimilarity is a more descriptive observation of difference whereas perceived expertise complementarity reflects a situation in which one not only differs from others (i.e., different types but similar levels of expertise) but also has equal status. Our results revealed, however, that team members need sufficient work experience in order to understand how the different expertise of another team member can complement their own expertise. As a whole, our results suggest that team members can have two kinds of perceptions: they can simply register whether and to what extent others are dissimilar, and they can perceive to what extent another’s expertise can complement their own expertise.
Interestingly, our results confirmed that both perceptions of expertise dissimilarity and expertise complementarity are important for predicting the effectiveness of teams. Specifically, because in previous research expertise complementarity was assumed to be a necessary requirement for the effectiveness of teams (e.g., Hanna & Walsh, 2002; Harrison, Hitt, Hoskisson, & Ireland, 2001; Levine & Moreland, 2004), we examined whether their combined impact would predict team performance. Supporting this assumption, we found that teams in which team members perceived that other team members had more dissimilar and more complementary expertise performed better confirming that expertise complementarity is crucial for the performance of teams.

**Theoretical Implications**

Our study enriches theory on the effects of expertise differences in teams for several reasons. First, our finding that objective proxies of expertise type and expertise level were both related to perceptions of expertise differences affirms assertions in recent research that expertise differences in teams involve more than just differences in types of expertise (cf., Van der Vegt, Bunderson, & Oosterhof, 2006; Zhou & Cummings, 2007). More importantly, the interaction between differences in educational background and educational level underscores suggestions to move beyond simple main effects models for understanding the effects of expertise differences in teams (cf., Harrison & Klein, 2007).

Second, our research challenges the commonly held assumption in prior research that expertise dissimilarity and expertise complementarity are synonyms (Hinds, Carley, & Krackhardt, 2000; Jackson, 1996; Krishnan, Miller, & Judge, 1997). For example, in their field study among top management teams, Krishnan et al. (1997: 361, italics added) stated that they examined “…the impact of complementary top management teams (defined as differences in functional backgrounds between the acquiring and acquired firm managers)…”. Other researchers do see expertise dissimilarity and expertise complementarity as separate constructs, but use an expertise dissimilarity measure to assess expertise complementarity (Hinds et al., 2000). We found, however, that expertise dissimilarity and expertise complementarity are essentially different constructs with different antecedents. Therefore, expertise dissimilarity and expertise complementarity should be regarded as separate concepts in future research.

Third, our finding that expertise dissimilarity and expertise complementarity are different concepts provides a different view on the inconsistent effects of expertise differences on the performance of teams in prior research. Indeed, the empirical literature examining the performance benefits of expertise differences in teams
has been equivocal, reporting positive relationships between expertise differences and performance in some cases and negative or null relationships in other cases (e.g., Jackson & Joshi, 2004; Webber & Donahue, 2001). Our results suggest that the effects of expertise differences on team effectiveness may be dependent on the extent to which team members perceive that their expertise is complementary. That is, it may be that the more team members perceive their expertise differences to be complementary, the better teams perform. This implication seems to be corroborated by earlier research of Campion and colleagues (1993). In their study on the relation between team characteristics and team effectiveness, expertise differences are operationalized with items concerning both expertise dissimilarity and expertise complementarity (e.g., “The members of my team vary widely in their areas of expertise”; “The members of my team have skills and abilities that complement each other”; Campion, Medsker, & Higgs, 1993: 849). Interestingly, and in line with our findings, this study reported a positive relation with team effectiveness again suggesting that expertise complementarity is important for understanding why some teams operate more effectively than others.

Strengths, Limitations, and Suggestions for Future Research

As with any study, the present study has its strengths and limitations. First, the fact that we examined expertise differences in real-life R&D teams strengthens the conclusions of our study because dyadic differences regarding education were salient and important to team members. However, a limitation is that these R&D teams were obtained from only one organization. Whereas testing hypotheses in one organization minimizes the likelihood that organizational-level factors, such as organizational culture, affected the findings, future research is needed to test the generalizability of these results.

Second, a strong point of our study is that we used data from multiple sources. Specifically, we related archival data on team members’ education and organizational tenure to interpersonal perceptions of expertise differences. In turn, we investigated how these perceptions were related to supervisor ratings of team performance. In adopting this approach we limited the influence of common method variance. Ideally, however, any study on perceptions of diversity would follow the variables over time to investigate the developments of these perceptions. By using a cross-sectional design, we were not able to investigate this. Future research could adopt a longitudinal design to investigate how interpersonal interactions influence the development of perceptions regarding expertise differences and team performance over time (cf., Van der Vegt, Bunderson, & Oosterhof, 2006).

Second, the application of a round-robin design regarding the dyadic perceptions
enabled us to obtain a fine-grained understanding of intrateam relations. By adopting this design we found that individuals had idiosyncratic perceptions of their relations with other team members regarding expertise dissimilarity and expertise complementarity. That is, individuals perceived themselves to differ more from some team members than from others and to experience more complementarity with some team members than with others. Yet, because this design requires self-report measures gathered by means of questionnaires, an unfavorable consequence may be that the relation between the variables of interest was affected by limitations of questionnaire studies such as common method variance or socially desirable responding. However, given that we related perceptions of expertise differences to archival data and supervisor data, we trust that this cannot provide an alternative explanation for our results. Moreover, the relatively low correlation between perceived expertise dissimilarity and perceived expertise complementarity suggests that this supposition falls short as a plausible explanation of the results.

**Practical Implications**

Although the findings of our study need to be replicated in more organizations, they offer an important implication for practice. Given that type-differences and level-differences in expertise frequently co-occur in R&D teams, our study offers a guideline for the appropriate management of these teams. Our research suggests that it is important that managers compose teams of members with different types and similar levels of expertise because this may endorse complementary intrateam work relations, and, eventually, better performing teams. In addition, albeit implicitly, our results also suggest that interpersonal cooperation may be improved by training team members to recognize each other’s expertise strengths and weaknesses. Team members may thereby develop more accurate perceptions of how the expertise other team members can be combined with theirs.