The Influence of Feedback and Expert Status in Knowledge Sharing Dilemmas

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Groups and organisations set cooperative goals for their members, yet in reality some team members contribute more than others to these goals. Experts, in particular, face a social dilemma: from the group's perspective they should share their knowledge, whereas individually they are better off not sharing, because acquiring knowledge is costly and they would give up a competitive advantage. Two experiments ($N_1 = 96$, $N_2 = 192$) tested the hypothesis, derived from indirect reciprocity theory, that experts contribute more if their status is being recognised. Expert status was manipulated under different performance feedback conditions and the impact on people's contributions in two different knowledge sharing tasks was analysed. In both studies, experts contributed more when feedback was individualised and public, ensuring both individual status rewards and public recognition. In contrast, novices contributed more when performance feedback was collective, regardless of whether it was public or private feedback. Novices did not have to fear negative performance evaluations under group feedback and could gain in social status as members of a successful group. Social value orientation moderated expert contributions in Study 2, with proself-oriented experts being particularly susceptible to reputation gains. The studies contribute to the neglected aspect of motivation in knowledge sharing dilemmas where collective and individual interests are not necessarily aligned.

INTRODUCTION

Expertise—both in terms of long-standing experience on the job as well as in terms of expert skills and high performance—is one of the most important resources in an organisation. Developing expertise and sharing knowledge for

the benefit of the organisation are central for organisational success (Davenport & Prusak, 1998; Wang & Noe, 2010) and studies of organisational performance suggest that businesses perform better if knowledge sharing is part of the organisational culture (Collinson & Wilson, 2006; Liu, Chen, & Tsai, 2005; Vera & Crossan, 2003). Consequently, many organisations have knowledge management systems in place to facilitate the exchange of knowledge and the storage of information (Ackerman, Dachtera, Pipek, & Wulf, 2013; Cabrera & Cabrera, 2002). However, knowledge management projects frequently fail because there are important motivational obstacles for sharing knowledge in organisations (Bock, Zmud, Kim, & Lee, 2005; Hinds & Pfeffler, 2003; Wittenbaum, Hollingshead, & Botero, 2004). In previous research on expertise and knowledge management, these motivational aspects of knowledge sharing have been largely neglected (Gagné, 2009; Hung, Durcikova, Lai, & Lin, 2011; Wang, Noe, & Wang, 2014).

In this paper, the framework of a classic public goods dilemma (Cabrera & Cabrera, 2002; Dawes, 1980) is proposed to understand the motivation to share or withhold expertise, an approach which, to date, has not been applied to knowledge sharing. In a knowledge sharing dilemma, individual decisions to contribute to the common good—in this case a group's or an organisation's collective pool of knowledge—depend on the perceived costs and benefits of knowledge sharing for the individual group member. These costs and benefits can be understood as a function of the degree of conflict between collective and individual interests as well as a personal preference for desired outcome distributions between self and others (Balliet, Parks, & Joireman, 2009). This means that the individual motivation to act cooperatively or competitively and to share or withhold knowledge is embedded in a social exchange relationship, for instance within a working group, and dependent on how the self and others are perceived with respect to the knowledge they can contribute and the potential gains from these contributions.

Experts are an especially challenging and interesting case in knowledge management because for them, the conflict between collective and individual interests is particularly pronounced as their expertise already gives them a clear competitive advantage over others and also a certain power within an organisation. It is thus important to understand what kind of incentives can motivate experts to share their knowledge with less experienced or less knowledgeable colleagues in order to disseminate expertise and foster knowledge development within a team or an organisation. This is especially important in a competitive work environment where employees compete for status, promotion, and salary rises, and where knowledge develops rapidly and qualified employees are highly mobile. Getting the experts on board to ensure knowledge transfer, interdisciplinary collaboration, and succession planning in key knowledge areas is essential for organisational success. A fairly recent review by Bunderson and Reagans (2011) found that power and status differences

together with conflicting interests are often the main barriers for knowledge sharing in organisations, even when it is clear that organisational members have critical knowledge.

In the following sections of the paper, the theoretically relevant processes in knowledge sharing dilemmas are identified and previous studies on knowledge sharing and expertise are reviewed to address relevant gaps in research, with regard to knowledge sharing as social dilemma, the status of experts and their motivation to contribute to the group outcome as common good.

KNOWLEDGE SHARING AS A SOCIAL DILEMMA

Davenport and Prusak (1998, p. 5) define knowledge as "a fluid mix of framed experience, values, contextual information, and expert insights" which puts knowledge in a hierarchical relationship with information. Knowledge always includes information, which is sometimes described as explicit knowledge or facts that can be passed on in a decontextualised way, such as in written reports. Knowledge—unlike information—also contains what is sometimes referred to as tacit knowledge which means that factual information is enriched by individual ideas, expertise, and judgements, and applied in a certain context (Moser, Clases, & Wehner, 2000). It is these individual ideas, experiences, and judgements that turn information into knowledge and that are highly relevant for individual, team, and organisational performance (Alavi & Leidner, 2001; Bartol & Srivastava, 2002). Knowledge sharing thus involves providing others with explicit knowledge (that is, information about facts, processes, and routines) as well as tacit knowledge (sharing experiences and know-how related to those facts and processes) to accomplish collective goals, to solve problems, to develop new ideas, or to implement policies and procedures (Cummings, 2004; Jackson, DeNisi, & Hitt, 2003; Nonaka & Takeuchi, 1995).

From a collective perspective, it is highly desirable that individuals share task-relevant knowledge and know-how with others, and hence organisations tend to set collective goals for their members. Yet, there are significant personal costs involved in acquiring knowledge and developing expertise (Bromme, Rambow, & Nückles, 2001) and these benefits might be lost if expertise is shared with others. For instance, once the knowledge is shared, it can be used by others regardless of whether they contributed to acquiring the knowledge. Thus, individual contributions might get lost in the overall group performance and this will increase opportunities for free-riding—individuals who profit from the knowledge but do not make any effort to contribute themselves. In addition, having expertise also has clear benefits for the individual. Expertise is often associated with a higher status, social recognition, higher pay and, as a consequence, the benefits of expert power. Hence, not only can the expert knowledge itself be used by others without acknowledging its origin, but experts could also lose their expert status as a consequence of sharing their

knowledge as their unique ability is devalued. Thus, sharing knowledge has all the properties of a social dilemma involving a conflict between individual and collective interests which can undermine the performance and effectiveness of organisations (Connolly, Thorn, & Heminger, 1992; Cress & Kimmerle, 2007; Cress, Kimmerle, & Hesse, 2006; De Cremer & Bakker, 2003; Moser, 2009; Moser & Wodzicki, 2007; Sanna, Parks, & Chang, 2003; Weber, Kopelman, & Messick, 2004).

The social dilemma of knowledge sharing is particularly pronounced in the case of experts who due to their superior knowledge have a higher ability to contribute to the group outcome than non-experts. As has been noted in past studies, the available expertise in groups is often not used to its full potential (Brandon & Hollingshead, 2004) and it is difficult to integrate experts into team work and committing them to group goals (Thomas-Hunt, Ogden, & Neale, 2003). So far, research on expertise has mainly focused on whether member expertise is being recognised by others in the group and how this affects team performance (Bonner, 2004; Bonner, Baumann, & Dalal, 2002; Littlepage, Robison, & Reddington, 1997; Stasser, Stewart, & Wittenbaum, 1995) but has not addressed the motivational obstacles involved in sharing knowledge.

THE ISSUE OF MOTIVATION IN KNOWLEDGE SHARING

The issue of motivation in knowledge sharing has been picked up in a few more recent studies, prompted by problems in knowledge management projects. Gagné (2009), for instance, has proposed a theoretical model to understand knowledge sharing motivation based on the Theory of Planned Behaviour (Ajzen, 1991) and Self-Determination Theory (Deci & Ryan, 1995). The theoretical model proposes to combine extrinsic motivational factors (human resource practices and sharing norms) as well as intrinsic motivational factors (individual attitudes and need satisfaction) as predictors of knowledge sharing. However, the model itself has not been tested empirically, and it does not take other group members' knowledge level or motivation to collaborate into account. Hung et al. (2011) conducted a study with students that investigated one intrinsic (altruism) and three extrinsic motivators (economic rewards, reputation feedback, reciprocity) for knowledge sharing. They found that only reputation feedback had a significant effect on knowledge sharing behaviour of the individual student, which was measured as idea creativity, idea usefulness, and quantity of ideas generated in an experimental creativity task. While the results indicate that reputation might be important for knowledge sharing, it remains unclear why economic rewards, reciprocity, and altruism did not affect idea generation. It was also not analysed whether individual contributions were influenced by the perception of the other group members as the focus was solely on individual performance. Wang et al. (2014) also

addressed the issue of personality and rewards in motivating knowledge sharing in a study with employees of a software firm by testing how the Big Five personality dimensions interacted with accountability inducing management practices. Although the authors mention that knowledge sharing can be seen as a public goods dilemma, Wang et al. used an interactionist framework and accountability theory to understand how individual differences and the evaluation of and reward for knowledge sharing by the supervisor affect knowledge sharing. The authors found the strongest effects of evaluation and rewards on employees who were less conscientious and more neurotic, whereas extraverted employees showed higher overall levels of knowledge sharing, also without any evaluation or rewards from the supervisor. This confirms the importance of accountability as a motivator for individual knowledge sharing, but only for less conscientious and more neurotic employees.

This still leaves considerable gaps in understanding the motivation to share knowledge. One important aspect is the social context of knowledge sharing and the fact that evaluation and feedback with respect to knowledge contributions are not given or perceived in isolation but always with reference to the knowledge and contributions of co-workers. More generally, this refers to the visibility of individual contributions in a social dilemma which is known to be a central factor in influencing cooperation (Hardy & Van Vugt, 2006; Tyler & Blader, 2003). Another important aspect is that people tend to have different levels of expertise with respect to a given task. This means that for most tasks and problems that groups work on, the potential to contribute to the group outcome is not evenly distributed among group members due to their different levels of knowledge. Because of this, the possible benefits and costs of collaborating will also be different for different group members and these individual differences are likely to influence the motivation to contribute to the group outcome. More generally, this refers to the criticality of individual contributions in a social dilemma which is another known important process influencing cooperation (Au, 2004; De Cremer & van Dijk, 2002).

CRITICALITY AND VISIBILITY AS MOTIVATORS IN KNOWLEDGE SHARING DILEMMAS

Conceptualising knowledge sharing as a public goods dilemma offers an explanation for why experts might not be motivated to share knowledge that can be costly to obtain. This does not mean, however, that experts are always reluctant to acquire and share critical knowledge. Rather, the social dilemma literature suggests that there are at least two motivational factors which foster individual contributions to public goods. The first is the criticality of the contribution and the second the visibility of the contributor in a given social context (e.g. a working group). Criticality of knowledge contributions can be influenced by making individual group members aware of their specific

expertise or lack of expertise in relation to the others in the group. Visibility of knowledge contributions can be influenced by feedback at the individual or at the group level, and can be given publicly or privately. This will make individual contributions visible in the case of individual feedback or invisible in the case of group feedback where individual contributions get lost in the overall group performance. Equally, knowledge contributions can be made public and visible to all, for instance if an employee of the year award is given or—on a more daily basis—if an employee's expert contributions are commended in a meeting or a newsletter, or they can just be recognised privately at the individual level, for instance as part of an appraisal or individual feedback by the supervisor. These different feedback strategies are standard managerial practices to set incentives and enhance performance in organisations. However, despite their practical importance for everyday management of work groups, criticality and visibility of knowledge contributions have so far not been included and tested in previous studies on knowledge sharing.

Criticality of Contributions

Theoretically, individuals would be expected to contribute to public goods if their contribution is critical for the team's success. Suppose one team member has some unique information that is crucial to the team's success (e.g. knowledge in soccer about how particular players of the opposing team take their penalties). Sharing this knowledge with the goal keeper may be crucial to winning the match. In game theory terminology, cooperation is the rational choice here because the team's success stands or falls with the provided information. In other words, the cooperative act is not altruistic but mutualistic (Scott-Phillips, Dickins, & West, 2011; Van Lange, Joireman, Parks, & Van Dijk, 2013).

A number of studies have shown that an individual is more likely to contribute if their contribution is critical to the group performance (Au, 2004; Au, Chen, & Komorita, 1998; Chen, Au, & Komorita, 1996; De Cremer & van Dijk, 2002). Criticality not only produces higher public good contributions but also increases the sense of social responsibility for the group welfare (De Cremer & van Dijk, 2002). In contrast, if group members' contributions do not make any difference they are less likely to cooperate (Kerr & Kaufman-Gilliland, 1997). Similar findings have been obtained in studies on trans-active memory showing that expert members feel more responsible for the group success once they know that their contributions are critical for the group (Hollingshead, 2000; Moreland, 1999; Moreland, Swanenburg, Flagg, & Fetterman, 2010). Experts should therefore contribute more if they are aware that they are the only expert in the group and should also feel an increased social responsibility (De Cremer & van Dijk, 2002).

Visibility of Contributions

A second factor in motivating experts to contribute is through increasing the visibility of their contributions. Indirect reciprocity theory (Leimar & Hammerstein, 2001; Nowak & Sigmund, 2005; Rockenbach & Milinski, 2006) suggests that individuals will cooperate if they get indirect returns from their cooperation, for instance, by attaining benefits in status and prestige that will enable them to recoup the costs of their altruistic group contributions. This status-based cooperation is sometimes referred to as competitive altruism— the idea that individuals compete for status by increasing their contributions to public goods (Hardy & Van Vugt, 2006; Roberts & Sherratt, 1998). As a practical example, suppose one employee in a travel agency has gained a lot of experience in previous jobs about what kinds of holidays families with young children find most attractive. He or she could share this information with her novice colleagues or keep it to him or herself. The above research suggests that he or she is more likely to share this information if the contribution is publicly recognised by, for instance, receiving praise from other team members, or through an award for outstanding contributions (Moser, 2009).

Computer simulations show that cooperation can spread through a population if the agents have image scores which indicate whether they have been cooperating or defecting in the past (Bardsley, Mehta, Starmer, & Sugden, 2010). One classic study using the Prisoner's Dilemma Game showed a 12 per cent increase in cooperation when choices were made publicly rather than privately (Fox & Guyer, 1978). According to Fox and Guyer, private decisions mean that individuals are "freed from the scrutiny of others [which] creates the conditions under which the individual can most easily depart from socially imposed standards of conduct in order to pursue self-gain at the group's expense" (p. 478). Making individual contributions visible to others increases cooperative behaviour because people can be rewarded for group success as well as punished for group failure (Hardy & Van Vugt, 2006; Tyler & Blader, 2003). Similarly, Wang et al. (2014) found an increase in knowledge sharing if employees' performance was evaluated by their supervisors and they were hence held accountable for the number of their contributions.

EXPERTISE AND EXPERT STATUS

Expertise can be defined as expert knowledge which refers to a high level of both experience and skills, and the ability to perform at a higher level than non-experts or novices (Ackerman, Pipek, & Wulf, 2003; Mieg, 2001). Because of their superior expert knowledge, the exchange relationship between experts and novices is always asymmetrical with respect to a specific domain of expertise. Novices or non-experts cannot reciprocate in kind and reward experts for sharing their expertise with knowledge contributions of their own. The

motivation for experts to contribute in a knowledge sharing dilemma can therefore not be the gaining of more knowledge, but is more likely to be recognition of their expert status, such as praise for their input (visibility of expert contributions) and confirmation of the importance of their expertise for an organisation (criticality of expert contributions).

The organisational recognition of the status as expert influences status perception, remuneration, and promotion in organisations, but it is not what is commonly associated with definitions of expertise and has not received much attention in expertise research. Most research to date falls into the area of cognitive psychology where expertise is usually defined as exceptional individual performance (Ericsson & Smith, 1991). Studies in this area investigate why certain individuals are able to develop exceptional levels of skills and knowledge in a specific domain, such as mathematics, music, or chess and aim to identify individual learning strategies and personality traits to explain the exceptional abilities of experts (Ericsson, 2005). It has, for example, been shown that experts can store more information in short-term memory (Ericsson & Chase, 1982), are better able to distinguish between important and unimportant information (Biederman & Shiffrar, 1987), can process larger amounts of information simultaneously (Chase & Simon, 1973), have more differentiated knowledge structures (Boster & Johnson, 1989), and develop more abstract categories (Honeck, Firment, & Chase, 1987) compared to non-experts. However, neither the motivation for sharing these exceptional skills nor the influence of the social context in which the sharing of expertise with others takes place has been addressed in past research.

Some research in social and work psychology has studied the task context of expertise and how it influences group performance, such as the matching of expertise to tasks and task characteristics (Brandon & Hollingshead, 2004; Brauer, Chambres, Niedenthal, & Chatard-Pannetier, 2004) or the influence of task experience on recognition of expertise (Bonner et al., 2002; Littlepage et al., 1997). Some further studies have investigated how expert knowledge can be coordinated in teams (Faraj & Sproull, 2000) and how teams of experts develop shared mental models and trans-active memory systems (Cannon-Bowers, Salas, & Converse, 1993; Hollingshead, 2000; Hollingshead & Fraidin, 2003). A few studies considered expertise from the perspective of expert roles in a group or organisation (Bunderson, 2003; Stasser et al., 1995; Thomas-Hunt et al., 2003), which traditionally is a perspective more prominent in sociology than psychology (Mieg, 2001), and only one study has focused explicitly on status (Bunderson, 2003) and on how status cues within the group affected the recognition of expertise by others. A significant number of experimental studies on information sharing have used the hidden-profile paradigm (Stasser & Titus, 2003) to study the impact of shared vs. unshared information on group performance and the quality of group decision-making. The degree of unshared information of an

individual participant is sometimes referred to as expertise of that individual in the context of these studies.

While all of the studies above take into account how either the task or the group composition might impact on performance, none of them have investigated the motivation to share or withhold expertise or how this might relate to the status as expert within a group (Wittenbaum et al., 2004). However, in an organisational context, status definitions are fundamental to the way individuals are perceived, problems are solved, tasks are completed, and decisions are taken. The couple of existing studies that did include aspects of reputation and status suggest that expertise (Bunderson, 2003) and knowledge sharing (Hung et al., 2011) are likely to be driven at least in part by status and reputation motives. In organisations, exceptional professional knowledge is usually associated with a higher status, higher pay, an expert reputation (Hinds & Pfeffler, 2003), and expert power (Mieg, 2001; Finkelstein, 1992; French & Raven, 1959). Unskilled or less experienced workers often have a more limited range of responsibilities, are paid less, belong to lower hierarchical levels, and thus have a lower status compared to more experienced employees with more responsibilities.

THE PRESENT RESEARCH

The present research aimed to address these gaps in research by studying the motivation to share knowledge and how it relates to the status as expert or novice in a group or organisation. Figure 1 gives an overview of all manipulated
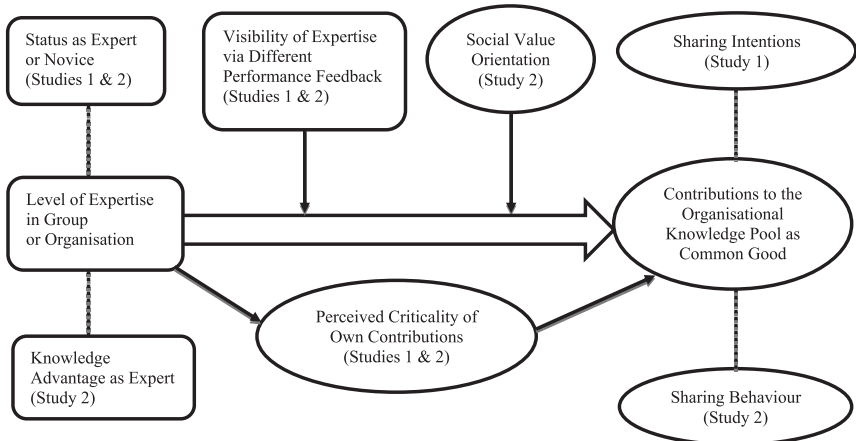

FIGURE 1.   Model of expertise in groups: Knowledge sharing as a social dilemma (manipulated variables are shown in rectangles, measured variables in ovals).

and measured variables in the two experimental studies. Both studies used a social dilemma framework as a new approach to understand the motivation for knowledge sharing, and the main hypothesis derived from indirect reciprocity theory was that status gains will motivate experts to share their knowledge. The two psychological processes explaining the motivation to contribute to the common good—that is the organisational knowledge pool in this case—are the criticality and visibility of expert knowledge. Both criticality and visibility of expertise can be determined only in relation to the knowledge of the other members in a group or organisation and will in turn determine the potential status gains. This inherently social aspect of knowledge sharing has not been addressed in previous research, just as criticality and visibility of knowledge contributions have not been included in previous studies.

Group members have expert status if they are aware that they possess knowledge other members do not have and that their knowledge is thus critical for the group task. Experts receive status confirmation or gain status if their expert contributions are acknowledged by performance feedback (visibility of contributions), which should increase their motivation to contribute their knowledge. Contributions should further increase if their contributions are publicly recognised, and they should decrease if their expert status is threatened by not giving individual performance feedback which means that their contributions are not visible and get lost in the overall group contributions.

Both criticality and visibility were manipulated in both studies to test the motivational consequences of status gains and losses on knowledge sharing. The perceived criticality of expert contributions was tested as a mediator that should influence knowledge sharing if the difference in expertise was also subjectively perceived as being critical to the group outcome. In addition, individual preferences might also influence knowledge sharing, which is why social value orientations of participants were included in Study 2 and tested as a moderator. As dependent variables, both knowledge sharing intentions and knowledge sharing behaviour were measured in Study 1 and Study 2, respectively.

In the two experiments two independent samples and two different knowledge sharing tasks were used to create a knowledge sharing dilemma and to test the hypotheses. Participants in both studies were assigned either expert or novice status and received feedback about the quality and quantity of either their individual performance (in relation to other individuals in the group) or about their group's performance (in relation to other groups). From the perspective of the expert group member, individual feedback is more desirable because it acknowledges the importance and criticality of their contribution. In contrast, for novices individual feedback may be threatening as it can reveal their limited contributions. Thus, experts and novices are expected to show significantly different reactions to performance feedback as they compete to perform well in a group task where they know that knowledge is distributed

asymmetrically among group members. Both experts and novices are also expected to want to protect their status and their reputation by avoiding status and reputation threats and by aiming to increase status and reputation if possible.

It is hypothesised first that, relative to novices, experts increase their contributions under individual feedback relative to group feedback (Hypothesis 1a). In contrast, it is predicted that the performance of novices will increase under group feedback conditions (Hypothesis 1b). In group feedback conditions novices will be less fearful of evaluation apprehension which has been shown to inhibit individual knowledge sharing at work (Bordia, Irmer, & Abusah, 2006). Furthermore, as low status members, novices are likely to assign more importance to group status than individual status (Ellemers, Wilke, & Van Knippenberg, 1993) and will make a greater effort under group feedback conditions.

It is also hypothesised that for experts the motivating effect of individual feedback will be further enhanced if the feedback is public (Hypothesis 2a). Making individual contributions public, for example, in the form of personal awards, should increase expert contributions through status motivations. Experts should contribute the least when feedback is group-based and private.

There is no strong prediction for novices. In the public condition, novices might be exposed as poor contributors (free-riders) and so they should step up their performance compared to the private condition. Yet given their lack of expertise they are expected to still perform significantly worse than experts even under public conditions (Hypothesis 2b).

In Study 2 a control condition without feedback has been included to obtain a baseline measure of knowledge sharing behaviour for both experts and novices that does not manipulate visibility of contributions. In the absence of any feedback it is expected that novices and experts will not differ significantly in their contributions (Hypothesis 3). Making contributions to the team task should present a similar knowledge sharing dilemma for both experts and novices, with both potential costs and benefits associated with it, but no clear (dis)incentive that could tip the scales towards either cooperation or defection.

Several social psychological processes are expected to mediate and moderate the impact of feedback on knowledge sharing. In individual (versus group) feedback conditions, perceived criticality of knowledge should be higher among experts, as they actually can contribute more to the group outcome. If this is the case, then perceived criticality should mediate their increased contributions (Hypothesis 4). In addition, social value orientation as a fairly stable personal preference for either prosocial or proself oriented outcomes of cooperation situations would be expected to moderate contributions (Balliet et al., 2009). Prosocially oriented participants are expected to contribute more overall and proself oriented individuals less in a knowledge sharing dilemma regardless of status gains (Hypothesis 5).

STUDY 1

In the first experiment the hypotheses were tested with a scenario study involving student work groups. The manipulated variables were the status as either expert or novice, and the type of feedback (individual vs. group) and (public vs. private) in a 2 × 2 × 2 between-subjects design. This allowed for testing the hypothesised interactive effects between expertise level and the type of feedback on expert versus novice contributions to the common good.

METHODS AND DESIGN

Participants and Procedure

Ninety-six undergraduate students in psychology from a UK university took part in Study 1 (48 women, 48 men; age: $M = 21.44$, $SD = 2.34$, two missing values). Participants received credits for taking part in the study as a contribution towards fulfilling study requirements. Participants were randomly assigned to one of eight conditions ($n = 12$ per cell) of the 2 (experts vs. novices) by 2 (individual vs. group feedback) by 2 (private vs. public feedback) between-participants design.

The experimental task was a student work group scenario adapted from Moser and Wodzicki (2007). The task was to imagine working in a three-person group on a compulsory course project that involved doing literature research, writing a term paper, and making a presentation in class. The experimental task simulated a typical student assignment that students were already familiar with. In terms of team development stage, the scenario was typical of the early forming stages of teams when tasks and roles still need to be assigned and team members do not know each other yet. The set-up allowed controlling for information about the other team members without inference of variables such as gender, age, or likeability. The students decided if they wanted to share information about literature and slides in preparing the presentation and term paper. Sharing their knowledge was costly as it takes time to research the literature and prepare the slides. On the other hand, they could profit from other students' literature searches and slides as input for their own part of the term paper and presentation. In this way the developed experimental paradigm represented a knowledge sharing dilemma. If everyone shared their information, both the individual student and the group could profit and perform better. If only one student shared his/her literature and slides, he or she would be exploited by the free-riders in the group and could not profit from others. As the dependent variable, knowledge sharing intentions were measured with a three-item scale as detailed below (Moser & Wodzicki, 2007).

Expertise Manipulation.   Expert or novice status was manipulated between subjects. In the "expertise" condition, participants were told that they had already written two similar term papers and were already familiar with some of the suggested literature from a previous seminar, while the other two students in the group wrote a term paper for the first time and had never done a presentation before. In the "novice" condition, participants were told that they had never written a term paper before and were not at all familiar with the literature, while the other two group members had already written a term paper twice and were familiar with some of the suggested literature from a previous seminar.

Feedback and Visibility Manipulation.   In the "individual" feedback condition participants were informed that after completion of the task they would receive feedback about how well they performed in relation to the other students in the group. In the "group" feedback condition participants were informed that after completion of the task their group would receive feedback about how well they performed in relation to the other student groups.

In the private feedback condition, participants were informed that after completion of the task the students would be informed privately how well they did (ranking of marks) in comparison to all other students/to the other student groups. In the public feedback condition participants were informed that after completion of the task the ranking of marks would be published on the intranet of the university and the best student/best group would receive a gift voucher and be showcased in the university online newsletter.

After having read the general introduction to the experiment and the consent form, participants were randomly assigned to one of the eight experimental conditions and read the respective scenario texts informing them of their expert or novice status in the group and the type of feedback they would receive afterwards (public vs. private and group vs. individual), respectively. Subsequently, they answered the manipulation check and a short questionnaire with the cooperation intentions and perceived criticality scales along with socio-demographic information. The scenario was a paper-and-pencil version and participants were sitting in individual cubicles while giving their answers.

Manipulation Check

The manipulation of expertise, feedback type, and visibility were checked by conducting *t*-tests. They revealed that the manipulations were successful. Experts rated themselves as higher in expertise on the three-item scale ($M = 5.38$, $SD = 0.40$) than novices did ($M = 3.67$, $SD = 1.22$; $t(86) = -9.14$, $p < .001$) (e.g. "I am very experienced in writing and presenting term papers"). Participants in the public feedback condition agreed significantly more often ($M = 5.14$, $SD = 0.71$) with the item "The feedback about my performance/my

group's performance was made public for everyone" than participants in the private feedback condition ($M = 2.70$, $SD = 1.56$; $t(85) = 9.32$, $p < .001$). Further, participants in the group feedback condition agreed more strongly ($M = 5.15$, $SD = 0.82$) with the item "I knew that I would get feedback about my performance in relation to other groups" than participants expecting individual feedback ($M = 3.07$, $SD = 1.12$; $t(86) = -9.60$, $p < .001$). Eight participants failed the manipulation check for either the expertise or the feedback manipulation and were excluded from further analyses, which resulted in a total of 88 participants and between 7 and 12 participants per condition.

Measures

Cooperation Intentions.   Cooperation intentions were measured with a three-item scale by Moser and Wodzicki (2007) (negative sample item: I do not see any reason why I should work together with the other two students in such a situation; positive sample item: I am sure I will benefit from exchanging many ideas with the other two group members). Internal consistency was good with Cronbach's $\alpha = .79$.

Perceived Criticality of Own Contribution.   A factor analysis was conducted on the six items pertaining to the perceived criticality of one's own contribution and the importance of collective goals (sample item: I believe that my personal contribution is important for the performance of all group members; adapted from Hertel, Niedner, & Herrmann, 2003). It yielded evidence for one factor explaining 60 per cent of the variance. Thus, the mean ratings across the six items were averaged to form one overall score per participant indicating the perceived criticality of contributions for the group outcome, with a Cronbach's $\alpha = .85$.

All measures were obtained after the scenario descriptions. All items were rated on a 6-point scale, ranging from "strongly agree" to "strongly disagree".

RESULTS AND DISCUSSION

Cooperation Intentions

Three 2 (experts vs. novices) $\times$ 2 (individual vs. group) $\times$ 2 (private vs. public feedback) analyses of variance (ANOVA) were conducted to test the overall influence of expert status, type of feedback, and visibility of feedback on cooperation intentions. Having expert status increased intentions to share knowledge ($F(1, 80) = 35.87$, $p < .001$, $\eta^2 = .31$) significantly. Neither type of feedback nor visibility of feedback had a main effect on intentions to share knowledge (Table 1), but there was a significant interaction between type of

TABLE 1

Analyses of Variance for Knowledge Sharing Intentions in Study 1 ($N = 88$)

	df	F	η^2	p
Expertise (E)	1	35.869	.310	.000
Feedback (F)	1	1.941	.024	.167
Visibility (V)	1	1.097	.014	.298
E × F	1	11.761	.128	.001
E × V	1	0.063	.001	.802
V × F	1	0.160	.002	.691
E × F × V	1	2.882	.035	.093
Error	80	(0.478)		

feedback (group vs. individual) and expert status ($F(1, 80) = 11.76$, $p < .001$, $\eta^2 = .13$).

Feedback Type and Visibility of Contributions

Experts showed higher intentions to share their knowledge than novices overall across feedback conditions ($M_{expert} = 4.86$ vs. $M_{novice} = 4.0$), with their highest intentions when they expected to receive public and individual feedback ($M = 5.42$) as predicted (H1a and H2a). In line with these predictions, their intentions to share were significantly lower for group feedback, regardless of whether the feedback was private or public ($M = 4.50$ for both, Figure 2). For novices, in contrast, public and individual feedback elicited the lowest ratings
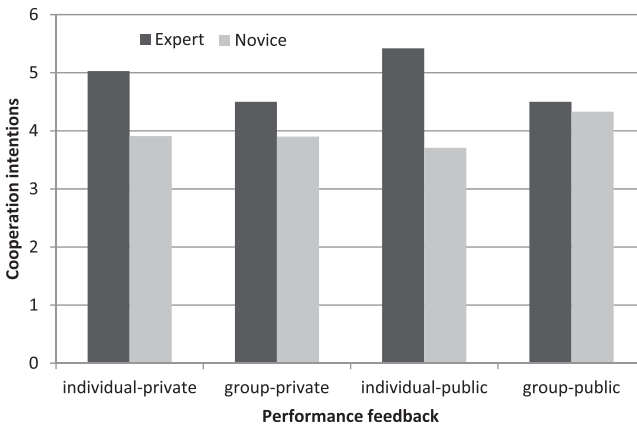

FIGURE 2. Knowledge sharing intentions for experts and novices under different feedback conditions in Study 1 ($N = 88$).

for cooperation intentions, confirming Hypotheses 1b and 2b ($M = 3.71$). They were much more motivated by public and group feedback ($M = 4.33$).

Perceived Criticality of Own Contribution

As predicted in Hypothesis 4, perceived criticality of own contributions had a significant main effect on contribution intentions ($F(1, 84) = 33.56$, $p < .001$, $\eta^2 = .29$). It also correlated significantly with cooperation intentions ($r = .84$, $p < .001$). To test whether perceived criticality of own contributions mediated the relationship between expertise and knowledge sharing intentions, a mediation analysis was conducted using the Hayes macro (Hayes, 2013, model 4), and following recent recommendations for mediation analysis (MacKinnon, Coxe, & Baraldi, 2012) and reporting of effect sizes (Preacher & Kelly, 2011). Results show that expertise was a significant predictor of perceived criticality ($a = .142$, $SE = .064$, $p < .05$, lower CI = .015, upper CI = .268) and that perceived criticality significantly predicted knowledge sharing intentions ($b = .878$, $SE = .069$, $p < .001$, lower CI = .740, upper CI = 1.015). Expertise was no longer a significant direct predictor in the simple mediation model ($c' = .023$, $SE = .044$, $p = .609$, lower CI = $-.065$, upper CI = .110), consistent with full mediation. The model used 5,000 bootstrap samples, with reported confidence intervals at 95 per cent, and explained a variance of $R^2 = .649$, with an absolute indirect effect size for perceived criticality of $ab_{cs} = .124$, and a relative effect size of $P_M = .847$.

STUDY 2

The second experiment aimed to replicate but also to further extend the results of the first experiment in several ways. Study 2 used a different experimental paradigm that tested actual knowledge sharing behaviour instead of sharing intentions. The hypotheses were tested with a knowledge sharing task in which participants were working for a travel agency as members of a geographically distributed team and could contribute information to a collective database of holiday offers. This set-up mirrored a work situation that is increasingly common and in which team members collaborate remotely via an electronic platform (a database system in this case) without any direct way of observing others' behaviour (Moser & Axtell, 2013). In such a work situation people know little about each other, which allows for testing what effect knowing about one's own expert or novice status in relation to others' level of expertise has on knowledge sharing behaviour. The behavioural paradigm in Study 2 again presented a knowledge sharing dilemma where providing information for the database benefited the whole team but it was personally costly in terms of time invested for finding and uploading the information.

In addition, Study 2 included and tested two different aspects of expertise: As in the first study, expert or novice status was assigned randomly to participants. In addition, however, in the second study participants in the expert conditions were also given an actual knowledge advantage by having additional professional knowledge about the task that novices did not have. This was possible because Study 2 used an experimental paradigm with a behavioural task. This also allowed to better simulate actual work situations and provided higher ecological validity (whilst maintaining experimental control). The behavioural task chosen simulated a distributed team that was newly formed and in the early stages of collaborating together via an electronic database. Having additional professional knowledge also meant that experts could outperform novices in the experiment because they had superior work task knowledge.

Study 2 had four feedback conditions for novices and experts, respectively, in a two-factorial between-subjects design: A no feedback condition (as baseline and control), an individual feedback, a group feedback, and a public feedback condition. The control condition was added to test the hypothesis that without any incentive the knowledge sharing task should present the same social dilemma for both experts and novices and thus not make a difference to their knowledge sharing behaviour (H3). The second study included just one public feedback condition, the individual one, which was the condition that showed the most pronounced differences between experts and novices in Study 1. In addition to the perceived criticality of contributions the social value orientation (SVO) of participants was also measured to test whether personal preferences for either cooperative or competitive outcomes influenced and moderated expert contributions (Hypothesis 5).

METHODS AND DESIGN

Participants and Procedure

One hundred and ninety-two undergraduate and graduate students from a German university participated in Study 2 (104 women, 86 men, 2 missing values; age: $M = 23.73$, $SD = 3.91$). On average, they had been studying for 2.75 years ($SD = 1.63$). Participants were recruited on campus and took part in either a lottery as compensation or received credits for fulfilling their study requirements. The design was a two-factorial between-subjects design with the factor expertise "expert" vs. "novice" and the factor feedback with four different feedback conditions ($n = 24$ per cell), "individual feedback", "group feedback", "individual public feedback", and "no feedback" (control condition).

An experimental paradigm of a consulting team in a travel agency was used to test the hypotheses in this second experiment (Moser, 2009). Participants were members of a virtual team, representing a travel agent in a large region and working individually in dispersed locations. All client requests were

handled on-line only. The experimental task simulated a virtual team environment. The set-up allowed controlling for information about the other team members without inference of variables such as gender, age, or likeability with respect to the other team members.

The team members had to answer client enquiries as fast as possible, using lists to look up the required hotel information, available leisure facilities and calculating the prices for the clients. The client requests included finding the appropriate hotel with the cuisine requested (e.g. French, Italian, Indian cuisine), the leisure facilities requested (e.g. swimming pool, wellness facilities, hiking trails, skiing, riding), and calculating the total price for the stay for the requested number of people and nights. Finding the appropriate information in the lists and calculating prices required approximately 3 to 5 minutes, which represented the individual costs of acquiring information in the social dilemma task. The results had then to be entered on-line and were sent to the client. Team members of the virtual travel agency team could only communicate through a database system, where the results of client requests could be saved on a voluntary basis and be made accessible to all team members. If other team members had already had the same request and had voluntarily entered the information into the database system, the answer to the client enquiry was available for all in the database and only two clicks and a few seconds away, and could be handled very quickly. Otherwise it took up to 5 minutes to find all the information required, make the price calculation and enter it on-line. The team members had then to decide whether they wanted to make the result of their client request available to all team members, or whether they would rather keep the information to themselves.

The duration of the entire experiment was approximately 30 to 45 minutes for most participants. There was no cut-off time for finishing the experiment, but all participants completed the experiment in under an hour. The experimental paradigm thus represented a knowledge sharing dilemma: if enough team members put the results of their calculations into the database for everyone, both the individual team members and the team could profit and perform faster. If only a few shared the results of their calculations, they would be exploited by the free-riders in the team and could not profit from others. Individual costs of acquiring information were represented by the 3 to 5 minutes it took participants to find the required hotel and calculate the price of the stay for the clients if the result of that specific client request was not already available in the database. If the other team members did not reciprocate and enter their results into the database, this investment was the risk the pro-socially acting team members took, and the profit for the free-riders in the team. As dependent variable, knowledge sharing behaviour was measured by the number of individual contributions to the database.

Expertise Manipulation.   In the second study, participants were not only assigned expert or novice status as in Study 1, but in addition the participants in the expert condition were told that they had long-standing experience in consulting, and thus knew which combinations of leisure activities and number of nights and persons were the most frequent customer requests (e.g. families with two children staying seven nights and requiring a swimming pool). Their expertise was thus represented by an actual knowledge advantage over the novices in the team. They were told that they had set up their own tables with the results for the most frequent requests and were thus able to process the customer requests much faster. These results could be found in the form of "expert lists" among their materials and gave the expert participants a real competitive advantage compared to novice participants. In addition to the different costs and benefits of cooperation depending on the feedback participants received and the subsequent loss or gain of status rewards that was part of the designs in both Study 1 and Study 2, Study 2 also explicitly included a competitive advantage for experts as they had additional task-relevant knowledge available that novices did not have. In the novice condition, participants were told that they were new to the team and had little experience in consulting. They knew that certain combinations of customer requests were more frequent, and were aware that other team members had developed a high expertise and did not have to calculate the most frequent requests again each time, which put them at an advantage.

Feedback and Visibility Manipulation.   In the individual performance feedback condition, participants were informed that after completion of the task they would receive feedback about how well they performed in relation to all other consultants in the team. In the group performance feedback condition, participants were informed that after completion of the task their team would receive feedback about how well they performed in relation to other consulting teams of the same travel agency. In the individual public performance feedback condition, participants were informed that after completion of the task all team members would be ranked according to their performance and the ranking would be published on the intranet of the travel agency, thus publicly identifying the highest performing team member. In the control condition, no performance feedback was announced or given.

Participants were randomly assigned to one of the eight experimental conditions, with 24 participants in each condition. Participants worked at computer terminals in individual cubicles and were under the impression that they were interactively connected with other participants when completing the experimental task. In fact, all interaction was simulated on the computer. As dependent variable, knowledge sharing behaviour was measured by the amount of individual input into the database when answering client requests. Afterwards, participants filled out a short on-line questionnaire with

manipulation check items, the Decomposed Game Measure, the perceived criticality scale and socio-demographic information. They were then debriefed and thanked.

Measures

Manipulation Check.   As manipulation check the participants were simply asked whether they had expert knowledge or not, respectively. Feedback manipulations were checked by asking whether feedback was announced or not before starting the task.

The manipulation of "expert" versus "novice" conditions was successful for both manipulation check items. Equally, the manipulation check for the feedback condition was answered correctly. All 192 participants were thus included in the analyses.

Contributions to the Database.   Knowledge sharing behaviour was assessed through the number of contributions to the database system during completion of the experimental task.

Perceived Criticality of Own Contribution.   Perceived criticality of own contribution was assessed with three items from the same scale as used in Experiment 1. Items were adapted from Hertel et al. and rated on a 6-point scale ranging from $1 = $ *strongly disagree* to $6 = $ *strongly agree* (Hertel et al., 2003). A sample item is "My skills and knowledge are key for the performance of the whole team". With Cronbach's $\alpha = .85$, reliability of the scale was satisfactory.

Social Value Orientation.   Social value orientation (SVO) was assessed with the Decomposed Game Measure (DGM) (Van Lange, De Bruin, Otten, & Joireman, 1997) which is one established way of measuring SVO by identifying only those individuals as either prosocial or proself who consistently and for a majority of decision situations choose either cooperative outcomes that benefit both others and the self, or egotistical outcomes that benefit the self. The DGM consists of nine items, each containing three pairs of outcome distributions for oneself and an unknown other, and each representing a prosocial or a proself orientation. Respondents are required to select one of the three pairs for each item. When respondents choose at least six pairs with the same outcome distributions corresponding with the respective orientation, they are classified accordingly. For example, if a respondent chose six times the distribution that contained an equal number of points for self and for the other, they were classified as being prosocial. If less than six choices were made for one distribution, the participants were not classified at all. This led to a slight reduction in the sample size to a total of 167 participants, of which 91 participants
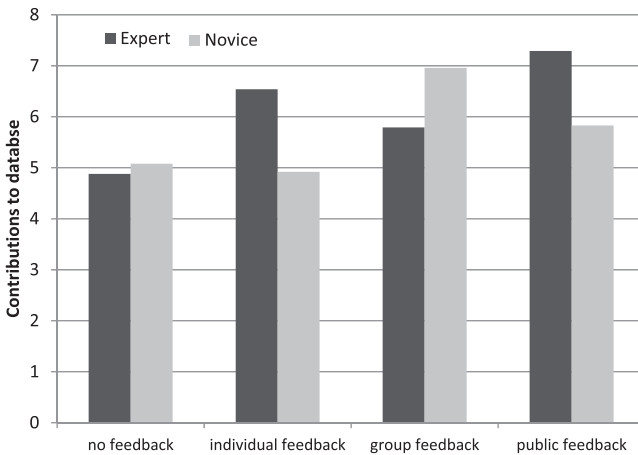
FIGURE 3.   Knowledge sharing behaviour by experts and novices under different feedback conditions in Study 2 ($N = 192$).

had a prosocial and 76 a proself orientation. Results reported below that include SVO are based on the reduced sample. All other analyses include the full sample of 192 participants.

RESULTS AND DISCUSSION

Contributions to the Database System

Results showed that without feedback (H3, control condition), novices and experts did not differ in their knowledge sharing behaviour as predicted ($F(1, 184) = 1.26, p = .26, \eta^2 = .01$).

Contributions to the Database System with Individual vs. Group Feedback and Public Feedback

If feedback was given, overall knowledge contributions increased for both novices and experts compared to the control condition ($F(3, 184) = 3.54, p = .02, \eta^2 = .06$) regardless of whether it was individual or group feedback. There was also a significant interaction effect of type of feedback with expertise, showing that experts shared more information when individual feedback was given and less when group feedback was given ($F(3, 184) = 3.13, p = .03, \eta^2 = .05$) which corresponds with the hypothesis (H1a). Novices in contrast (H1b) showed a reverse pattern of reactions to feedback and contributed less under individual feedback conditions, but increased their contribution if group feedback was given (see Figure 3). Exactly the same

pattern as for individual feedback but with even higher contributions for both novices and experts was shown when feedback was public (H2a and 2b), with the highest level of contributions by experts for public individual feedback as predicted (H2a).

Perceived Criticality of Own Contributions

As predicted (H4), perceived criticality of own contributions had a significant main effect on contributions to the database system ($F(1, 188) = 25.39$, $p < .001$, $\eta^2 = .12$). It also correlated significantly with the number of contributions ($r = .464$, $p < .1$). There were also interaction effects of perceived criticality and types of feedback ($F(3, 184) = 6.06$, $p < .001$, $\eta^2 = .09$). While there was no difference in perceived criticality between experts and novices in both the group feedback and the no feedback condition, t-tests showed that experts saw their contributions as much more critical to the group performance under the conditions of both individual private feedback ($p < .01$) and individual public feedback ($p < .001$). To test whether perceived criticality of own contributions mediated the relationship between expertise and knowledge sharing behaviour, a mediation analysis was conducted using the Hayes macro (Hayes, 2013, model 4), and following recent recommendations for mediation analysis (MacKinnon et al., 2012) and reporting of effect sizes (Preacher & Kelly, 2011). Results show that expertise was a significant predictor of perceived criticality ($a = .281$, $SE = .135$, $p < .05$, lower CI = .016, upper CI = .547) and that perceived criticality significantly predicted knowledge sharing intentions ($b = 1.343$, $SE = .189$, $p < .001$, lower CI = .970, upper CI = 1.717). Expertise was no longer a significant direct predictor in the simple mediation model ($c' = .049$, $SE = .356$, $p = .890$, lower CI = $-.652$, upper CI = .751), consistent with full mediation. The model used 5,000 bootstrap samples, with reported confidence intervals at 95 per cent, and explained a total variance of $R^2 = .215$, with an absolute indirect effect for perceived criticality of $ab_{cs} = .378$, and a relative effect size of $P_M = .885$.

Social Value Orientation

Prosocials and proselfs were equally distributed over the two expertise conditions ($\chi^2(1, N = 167) = 1.51$, $p = .219$). In other words, experts did not differ from novices in their prosocial ($t(190) = -.409$, $p = .683$) or their proself orientation ($t(190) = .504$, $p = .615$). As predicted in Hypothesis 5, social value orientation moderated expert contributions (Table 2). First, a 2 (expertise) × 2 (social value orientation measured by DGM) ANOVA was conducted. It revealed two main effects and an interaction effect, with prosocials being generally more cooperative than proselfs, and with experts being more cooperative than novices and especially so when they had a prosocial value orientation (see Figure 4). A second 4 (feedback) × 2 (social orientation)

TABLE 2
Analyses of Variance for Knowledge Sharing Behaviour in Study 2 ($N = 167$)

	df	F	η^2	p
Expertise (E)	1	4.956	.030	.027
Social value orientation (S)	1	13.572	.077	.000
E × S	1	6.412	.038	.012
Error	163	(6.016)		
Feedback (F)	3	1.537	.028	.207
Social value orientation (S)	1	16.673	.095	.000
F × S	3	1.300	.024	.276
Error	159	(6.249)		
Expertise (E)	1	4.901	.031	.028
Social value orientation (S)	1	15.595	.094	.000
Feedback (F)	3	1.499	.029	.217
E × S	1	5.573	.036	.020
E × F	3	4.433	.081	.005
S × F	3	1.132	.022	.338
E × S × F	3	.825	.016	.482
Error	151	(5.662)		

ANOVA revealed a main effect of social value orientation with prosocials being more cooperative than proselfs, irrespective of the feedback condition. A third 2 (expertise) × 2 (social value orientation) × 4 (feedback) ANOVA revealed main effects of expertise and social value orientation, and interaction effects of both expertise and social value orientation, and of expertise and feedback type (see Table 2)
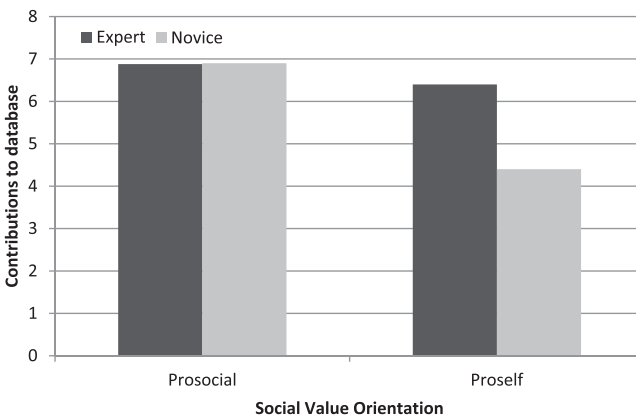

FIGURE 4.   2 (expertise) × 2 (SVO) Analysis of Variance for knowledge sharing behaviour in Study 2 ($N = 167$).

GENERAL DISCUSSION

This paper makes novel contributions to understanding the motivation to share or withhold knowledge, an area that has received little attention in research in the past despite its great practical significance for knowledge management projects in organisations. It does so by proposing to understand knowledge sharing as a social dilemma because this theoretical framework allows for explaining so-called mixed-motive situations where collective and individual interests are not necessarily aligned. In both studies and different from previous research, an experimental design was used, with two different experimental tasks and two independent samples, which allowed to empirically test the importance of status and reputation gains for knowledge sharing of experts and novices by manipulating the criticality and visibility of knowledge contributions.

Conceptualising knowledge sharing as a social dilemma addresses a gap in research on knowledge management and information sharing where motivational aspects have been neglected in the past. Understanding the motivations to collaborate is especially important if knowledge is unevenly distributed in a group, with some members having significantly more expertise than others and thus being able to contribute more to the group outcome than others. It is also a situation that is very common in the work context as different team members rarely have exactly the same level of experience and the same set of skills with respect to a specific task.

Based on the social dilemma literature, the two studies presented here focused on two psychological processes that are known to influence contributions to the public good: the criticality of contributions and the visibility of the contributor. Previous research has shown that if people know that their contribution will make a critical difference to the success of the group outcome, they are more willing to contribute (Au, 2004; Au et al., 1998; De Cremer & van Dijk, 2002). Experts should hence be more willing to contribute if they are aware that they are the only expert in the group. A second important factor is the visibility of contributions to the group outcome. Previous organisational research suggests that experts and knowledge sharing (Bunderson, 2003; Hung et al., 2011) are at least partly driven by status and reputation motives and that receiving recognition for expert contributions might be a very important motivator. Based on indirect reciprocity theory, it was proposed in this paper that experts would be more likely to cooperate if they receive indirect returns in the form of status benefits and reputational gains for their contributions to the collective good (Nowak & Sigmund, 2005; Rockenbach & Milinski, 2006). The two studies tested this by using different types of feedback (individual vs. group and private vs. public feedback) in two independent samples and two different knowledge sharing tasks. Study 1 used a scenario design for student group work and Study 2 simulated a virtual team with actual knowledge sharing via a database system.

In both studies, experts contributed more than novices if they knew they were the only expert in the group and that thus their knowledge was critical for the group outcome. This was further confirmed in both studies by showing that the subjectively perceived criticality of own contributions fully mediated the relationship between level of expertise and knowledge contributions. These findings are consistent with previous studies on criticality in public goods dilemmas (Au, 2004; Au, Chen et al., 1998; Chen et al., 1996) and also with several studies showing an increase in feeling responsible for the group outcome if participants are aware of the criticality of their contributions (Moreland et al., 2010; De Cremer & van Dijk, 2002; Hollingshead, 2000).

Experts also responded strongly to indirect status gains in both studies if their contributions to the group outcome were made identifiable and visible through individual performance feedback. In contrast, if group feedback was given and expert contributions could not be identified, experts significantly decreased their contributions in both studies. Experts contributed the most if feedback was not only individual but also public and the feedback hence not only confirmed their status as experts, but in addition allowed for public recognition and further reputation and status gains. Again, this was consistent across both study samples and both knowledge sharing tasks and further supported the hypothesis that expert contributions in knowledge sharing dilemmas are motivated by status rewards and public recognition of expertise.

Novices, in contrast, showed the opposite pattern in both studies. They seemed to be somewhat reluctant to expose themselves as poor contributors if they knew that others in the group had more expertise and decreased their contributions if performance feedback was individual. This can be interpreted as an effect of evaluation apprehension which has previously been found to negatively affect knowledge sharing in the workplace (Bordia et al., 2006). Novices did, however, increase their contributions to the public good if feedback was given at the group level and they did not have to fear negative individual performance evaluations. Moreover, as lower status members, an additional motivator for novices might have been the fact that they could gain status and enhance their self-esteem by being a member of a successful group (Ellemers et al., 1993). If this was seen as a benefit, then it makes sense for novices to make a greater effort under group feedback conditions where there is no risk of individual exposure and where they can maintain a positive self-image.

In Study 2, a further contributing factor for the importance of the group for novices might have been the fact that all communication with other group members was anonymous and computer-mediated. Under conditions of anonymity the perception of self and others tends to become more depersonalised and, as a consequence, group identity can become more salient and influential (Spears & Lea, 1992; Spears, Postmes, Lea, & Watt, 2001). This could further explain the higher contributions of novices under the group feedback condition compared to both the no feedback and the individual feedback conditions.

The same mechanism could also further explain the differences between novices and experts. Since experts have an exceptional and highly individual status due to their expertise, they are more likely to perceive themselves as individuals and might be less subjected to the effects of depersonalisation in computer-mediated communication than novices. This supports the conclusion that novices could be just as susceptible as experts to potential status rewards, at least under public feedback conditions. However, due to their lower status and lack of expertise, novices responded very differently to the visibility of their contributions.

The second study also tested the hypothesis whether social value orientation (SVO)—which is usually conceptualised as a fairly stable personal preference for cooperation outcomes in dilemma situations (Balliet et al., 2009)—moderates expert contributions in a knowledge sharing dilemma. Results showed that—as expected—participants with a prosocial orientation consistently contributed more than those with a proself orientation regardless of whether they were experts or novices. Interestingly, for proself orientented participants, those with expert status and knowledge also showed higher contributions that were nearly as high as the prosocially oriented participants, but this was not the case for novice participants. This is consistent with some previous research showing that people with a proself orientation tend to be more strategic regarding the benefits of altruistic behaviour and that they are very sensitive to cues regarding power and status (van Dijk, De Cremer, & Handgraaf, 2004). For proself oriented experts, the status rewards in the form of recognition of their expertise seem to have acted as an incentive to share their knowledge and in this specific situation to in fact act prosocially because they may have seen it as an investment to maximise their own outcomes.

This confirms the importance of reputation gains in knowledge sharing dilemmas as a motivator at both the group level in terms of status confirmation and visibility of expertise to others and at the individual level, especially for those with a proself orientation.

Implications for Theory and Research

The paper makes novel contributions to previous research in several areas: first of all, it contributes to our understanding of knowledge sharing as a public goods dilemma. Knowledge sharing is central for the success of teams and organisations and ever more so in a work environment that moved from a production oriented to a service oriented industry with intangible assets as the most important resources (Collinson & Wilson, 2006; Liu et al., 2005; Vera & Crossan, 2003). Despite this relevance there is still little research about knowledge and information as public goods (Cabrera & Cabrera, 2002). The research presented shows how differences in the level and visibility of expertise can lead to different perceptions of benefits and costs in a knowledge sharing dilemma

and how this affects both the cooperation intentions and the actual knowledge sharing behaviour.

Conceptualising knowledge sharing as social dilemma offers an explanation why it can be difficult to integrate experts into team work and committing them to group goals (Thomas-Hunt et al., 2003). Experts need to have a recognised expert status for their expertise to be visible in an organisational context, which is why status and reputation gains act as strong motivators for experts to cooperate in a knowledge sharing dilemma, and which is also consistent with the assumptions of indirect reciprocity theory (Leimar & Hammerstein, 2001; Nowak & Sigmund, 2005; Rockenbach & Milinski, 2006).

The research presented is also consistent with the predictions of another approach to understanding cooperation, the group engagement model (Tyler & Blader, 2003), which proposes status judgements as central to understanding cooperative behaviour in groups. Groups serve as important sources of a positive social identity for individuals. According to the group engagement model, status evaluations are expressed in the pride and respect experienced by group members. Following from this, it can be assumed that a positive group performance feedback can raise the self-esteem of novices and strengthen their positive social identity as members of a successful group. Equally, experts can feel respected for their expertise and confirm their status within the group if they receive positive individual performance feedback. These positive status and self-evaluations in turn then increase the group engagement for novices and experts, respectively. The results thus extend prior research showing how positive status evaluations can lead to more cooperative behaviour (De Cremer, 2002, 2003; De Cremer & Tyler, 2005; Simon & Stürmer, 2003; Sleebos, Ellemers, & de Gilder, 2006; Spears, Ellemers, & Doosje, 2005) and extend them to the area of knowledge sharing dilemmas.

The results can also be interpreted in the light of research on group diversity: knowledge differences between expert and novice group members can be seen as an aspect of group diversity. Diversity in knowledge and occupational background should, in theory, lead to an increase in group performance, simply because more knowledge is available to the group. However, the effects of diversity on performance are very controversial, as in some instances diversity has been found to increase and in others to decrease group performance (Jackson & Ruderman, 1995). More recent findings in diversity research suggest that diversity can increase group performance if the diversity is explicitly recognised within the team, but will deplete team performance if an "all are equal" attitude is assumed (Guillaume et al., 2014; Guillaume, Dawson, Woods, Sacramento, & West, 2013). Following from this, expertise could also be conceptualised as an aspect of work group diversity and the increase in expert contributions if the experts know that their contribution is critical to the group outcome could also be interpreted within the Categorization-

Elaboration Model of work group diversity and performance (van Knippenberg, De Dreu, & Homan, 2004).

Possibly the most important contribution of this paper is that it addresses the motivation gap in research on knowledge sharing in a new way, by recognising that the individual motivation to share or withhold knowledge is part of a knowledge sharing dilemma. The differentiated analysis of the effects of criticality and visibility of knowledge contributions was only possible by using an experimental design which allowed for both assigning participants randomly to different conditions and for estimating the magnitude of the effects of expert status and feedback types on cooperation. This is a new approach in the area of expertise sharing in the work context.

Limitations and Future Research

As always, there are some limitations to the presented research. One limitation lies in the student samples used in both studies. Using a scenario of student work groups in Study 1 with a task that students generally have experience with has both advantages and disadvantages. Advantages are the higher ecological validity of a familiar task scenario compared to many dilemma games in the lab. The scenario set-up also has the advantage of allowing for controlling information about the other team members without interference of aspects such as age, gender or likeability. A possible disadvantage is that because of the familiarity with the task, related experiences in the real world might shape the answers in the scenario independently of the experimental conditions and thus weaken the effect of experimental manipulations. In addition there is the obvious disadvantage that only behavioural intentions and not actual behaviour can be measured when using scenario designs. In spite of that obvious disadvantage, the fact that there were rather strong effects in the scenario study actually strengthens the argument that the differences in knowledge sharing intentions can be attributed to the manipulation of expertise and feedback types rather than to confounding variables. In contrast, the research paradigm used in Study 2 simulated a team interacting via a database system similar to set-ups in many workplaces today. It had the important advantage of measuring actual knowledge sharing behaviour of the participants as opposed to looking at behavioural intentions as in Study 1. One possible disadvantage of Study 2 was that it required student participants to interact in a virtual team environment with which they did not necessarily have any experience. In addition, it can also be questioned how realistic it really is to have a virtual team setting where team members know so little about each other. However, this appears to be a work situation that tends to become more and more common, certainly at the start of introducing new work tools such as shared databases which then suddenly allow interactions with remote work colleagues that have previously worked entirely separately in different locations. So while both

research paradigms in Study 1 and in Study 2 have merit and ecological validity in being representative of student work groups and virtual service teams, respectively, they both simulate cooperation situations at the very beginning of team formation when members know little to nothing about each other and this poses a certain limitation to generalising the findings for other team types and other team development stages.

An important question with respect to further applicability to real work environments is how participants with extensive work experience would have behaved, both in the experimental set-up and in actual real team situations. Several aspects are likely to play an important role in real team situations that are difficult to simulate: most importantly, much more is at stake if team members know that they will have to continue working with the same colleagues in the future, and consequently the costs and benefits of cooperation might present themselves rather differently for individual team members. Further aspects that are likely to influence individual motivation to share knowledge in the real world are, for instance, likeability of other team members, past experiences regarding reliability and trustworthiness of colleagues, as well as the reputation of other team members with respect to those aspects. All of these are likely to influence the perceived value of cooperation vs. defection for individuals and might outweigh the advantages of status and reputation gains in a specific work situation.

Future research into knowledge sharing dilemmas should therefore take into account aspects such as prior experience with teamwork, value of the expert knowledge to the group, as well as the time frame of cooperation. Reputation and credibility of the source of knowledge is another important aspect that should be included in future research. It would also be worth considering running studies with experienced employees and gaining additional data from actual work interactions via electronic media and databases. Using real teams has of course severe limitations as it is usually not possible to systematically manipulate feedback or rewards in real work situations. Even just gaining access to work interaction data is often problematic because of ethical considerations and/or because it would interfere with the work process.

Another aspect worth considering in future research is the type of expertise that is studied. The two studies in this paper referred to two specific aspects of expertise definition, one being the recognition of expertise by explicitly awarding expert status to individuals, and the second one referring to the experiential aspects of expertise in terms of knowledge about work processes and tasks. This was defined as typical student task expertise in Study 1 (e.g. students already experienced in literature search and report writing vs. students doing these tasks for the first time) and in Study 2, expertise was defined as experiential knowledge about customer needs which gave the experts a performance advantage within the team. While this type of expertise is very common and important in the workplace it is not expertise in the sense of extremely high

specialist skills in a specific area (e.g. music, mathematics, chess, etc.), but more what is commonly achieved with greater experience on the job.

Practical Implications

There are a number of practical implications of the current research for knowledge management in organisations. As mentioned before, one of the main reasons why knowledge management projects fail are motivational obstacles. Generally, the importance of motivational aspects has been underestimated in the past. In the context of managing teams and organisations, it seems crucial for team leaders and managers to recognise the social dilemma of knowledge sharing for their employees, both experts and novices. They need to consider what they can offer their most treasured experts in exchange for their cooperation and how they differ in their motivation from non-experts or novices. Equally, they need to consider how novices can best be encouraged to engage in group efforts despite their lower contributions to the group outcome and why they might decrease their contributions even more to avoid exposure as non-experts. Recognition of the status as an expert seems to be among the highly valued rewards for employees with high professional skills, knowledge, and experience on the job. This seems to be especially true if an expert is proself oriented and thus even more susceptible to incentives for maximising their own outcome. Proself oriented individuals with high skills and exceptional knowledge often present one of the greatest challenges for team leaders in knowledge management projects, especially if they are very ambitious and competitive. The research presented can provide some guidance regarding the relevance of indirect status and reputation gains for these individuals and how to manage the sometimes rather "big egos" of experts, especially if they should also be proself oriented.

The results might also be of interest when managing virtual teams. There might be an even greater need to explicitly manage status differences in virtual teams compared to face-to-face situations, because other indicators of status, such as seniority, age, gender, and non-verbal dominance signals, tend to be less visible in a virtual work context. Further studies should therefore explore the possible differences of status perceptions and their importance in both virtual and real groups with respect to the individual motivation for cooperation and knowledge sharing.

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