Trust your teammates or bosses? Differential effects of trust on transactive memory, job satisfaction, and performance

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Abstract

Purpose – The purpose of this paper is to examine, in two studies, whether trust in teammates and trust in management influenced transactive memory and how strongly transactive memory, in turn, influenced perceived team performance and job satisfaction.

Design/methodology/approach – Data were collected via questionnaires from two samples of employees ($n_1 = 383$ and $n_2 = 40$). Regression and mediational analyses were employed to test the hypotheses.

Findings – Trust in teammates predicted transactive memory and transactive memory, in turn, predicted perceived team performance and job satisfaction. Trust in management did not predict transactive memory, but it did predict job satisfaction.

Research limitations/implications – Data are cross-sectional and cannot establish cause-effect-relationships. Furthermore, objective performance measures could not be obtained due to the nature of the studies. Thus, future studies need to use longitudinal or experimental designs and objective performance measures.

Practical implications – Intangible factors such as trust can strengthen knowledge sharing and transactive memory systems. This, in turn, can positively impact job satisfaction and team performance. Managers and team leaders should pay more attention to building a climate of trust and participation, both within teams and between team members and supervisors/management.

Originality/value – Results of two studies show the differential effects of trust in teammates versus trust in management. For finishing a knowledge-intensive task in a team, trust in teammates is more important than trust in management because trust influences transactive memory, which, in turn, leads to positive performance outcomes. However, for other organizational outcomes such as job satisfaction, trust in management can be as important as well.

Keywords Trust, Job satisfaction, Team performance, Knowledge management, Transactive memory

Paper type Research paper

Knowledge exchange in the work place

Organizations can be viewed as multi-layered knowledge receptacles. The information or knowledge stored in these receptacles exists at three levels: the organizational, team, and individual level. How knowledge from all three levels is eventually combined to facilitate effective functioning of the organization and to enable knowledge

management is deeply rooted in its transactive memory system. The concept of a transactive memory was first described by Wegner *et al.* (1985) as a framework for understanding the nature of cognitive interdependence of individuals in close relationships (see also Wegner, 1986, 1995). Transactive memory is defined as "an organized store of knowledge that is contained entirely in the individual memory systems of the group members and a set of knowledge-relevant transactive processes that occur among them" (Wegner *et al.*, 1985, p. 256). Thus, transactive memory encompasses both an individual component (an individual's knowledge about someone else's knowledge) and a social component (communication among individuals).

Our goal is to investigate some of the individual-level factors that influence the development of transactive memory. Among such factors, trust is particularly crucial because it influences whether individual group members are willing to share and exchange information and knowledge (Holste and Fields, 2010; McNeish and Mann, 2010; Niu, 2010; Sarker *et al.*, 2011). We are more specifically interested in investigating whether different sources of trust have different effects on transactive memory. At the same time, knowledge sharing and transactive memory influence various group and organizational outcomes (e.g. Zhang *et al.*, 2007). We are particularly interested in team performance and job satisfaction as outcomes, which are central for organizational success (Harter *et al.*, 2010; Ng *et al.*, 2009).

Transactive memory
A transactive memory system develops when individuals are brought together for some specific task and engage in social interaction. Through social interaction (i.e. verbal and non-verbal communication), knowledge is combined to serve the function of the team, thereby creating and, at the same time, using a transactive memory system. The system works because individuals use each other as external memory stores. A transactive memory encompasses shared knowledge (integration of knowledge), unshared knowledge (differentiation of knowledge), metaknowledge (knowledge about knowledge), communication among group members (transactivity, which includes seeking and sharing knowledge), and the degree to which group members are mutually dependent on one another (cognitive interdependence; which indicates how closely tied the transactive memory system is; e.g. Brauner and Robertson, 2009).

The main advantage of transactive memory as a construct over other constructs (for instance tacit knowledge sharing) is that it helps to explain the benefits of unshared knowledge in groups or organizations. Instead of exchanging unshared knowledge with colleagues, metaknowledge (knowledge about knowledge, e.g. Nelson, 1992, 1999) is shared. It requires less memory capacity and allows for less redundancy within a group. For instance, I do not have to remember all deadlines for filing reports in my department if my co-worker knows them all; instead of keeping track of the deadlines myself, I can ask my co-worker, or, even better, I can rely on my co-worker to remind me when it is time to submit a report. In work groups, metaknowledge allows group members to identify and address experts in areas in which the member him- or herself lacks expertise. The concept is extremely valuable for organizations because transactive memory allows for less redundant knowledge and more expert knowledge without jeopardizing coordination within a group or organization. It can also help in understanding and predicting multiple individual and team outcomes.

Following Ren and Argote (2011), who point out that the terms transactive memory and transactive memory system are being used inconsistently in the literature, we will

refer to transactive memory when we address knowledge that an individual holds about the knowledge of other people; this individual perspective is also the focus of our paper. We will use the term transactive memory system exclusively when we address the combined system of multiple people's individual transactive memories along with the communicative processes among them.

Model development and hypotheses

Trust and transactive memory. Transactive memory systems are vital to organizational knowledge management because they provide a deeper understanding of knowledge exchange in groups and organizations. Various predictors of transactive memory have been examined (for a review see Ren and Argote, 2011). Several studies addressed training (Liang *et al.*, 1995; Moreland *et al.*, 1996, 1998; Moreland and Myaskovsky, 2000), communication (Hollingshead, 1998), and expertise (Brauner, 2002; Faraj and Sproull, 2000; Hollingshead, 2000; Stasser *et al.*, 1995). Because a transactive memory system is a phenomenon integrating the social level and the individual level, interpersonal factors can be expected to play an important role for its use and development. For instance, sharing information with or requesting information from another person involves self-disclosure about one's own expertise. This requires that the person sharing or requesting the information trusts the addressee both with regard to their benevolence (for instance, keeping information confidential) and to the quality of the information (Davenport and Prusak, 1998/2000). Thus, trust is crucial for cooperation and collaboration in interpersonal and intergroup relationships in organizations. Frequent and consistent cooperation can lead to increased opportunities for coworkers to engage in valuable information and knowledge sharing, which is essential in transactive memory systems. Interpersonal trust at work is the extent to which workers in a group are willing to attribute good intentions to and have confidence in the words and actions of fellow group members or the management of an organization (Cook and Wall, 1980). Performance benefits associated with high levels of trust have been documented in traditional face-to-face work groups (Li *et al.*, 2007), virtual teams (Naquin and Paulson, 2003; Sarker *et al.*, 2011) as well as in tacit knowledge transfer (Holste and Fields, 2010; MacNeil, 2003). However, few studies have addressed trust as a determinant of transactive memory systems, and, moreover, they have yielded contradictory results.

Rau (2005) investigated the influence of transactive memory on performance in top management teams as a function of trust and relationship conflict. Findings revealed that top management teams performed significantly better when there were low levels of relationship conflict and when members were aware of the location of expertise. Trust was, however, only significantly correlated with one of four sub-dimensions of composition of expertise (dispersion in functional background); trust was not significantly correlated with knowledge of the location of expertise. Moreover, trust did not have a significant impact on the relationship between transactive memory and performance. In contrast, Akgün *et al.* (2005) reached different results. They investigated the relationship among team member stability, proximity, familiarity, interpersonal trust, and communication in transactive memory systems in new product development teams. These factors were all hypothesized to be positively related to the development of transactive memory. Results revealed that team stability, cognitive-based trust, affect-based trust, and team familiarity were all significant predictors of transactive memory.

This inconsistency between the results of Rau (2005) and the results of Akgün *et al.* (2005) can be explained after a closer inspection of the methodologies used. The scale used by Rau (2005) addresses exclusively trust in the employer rather than trust in co-workers or team members (see Robinson, 1996). Akgün *et al.* (2005) trust measure addresses exclusively peer relationships, with regard to confidence in competence on the one hand (cognitive-based trust) and benevolence toward the other on the other hand (affect-based trust; see McAllister, 1995; Kanawattanachai and Yoo, 2002).

Differentiating various sources (or targets) of trust seems particularly important given the hierarchical structure of organizations. According to Davenport and Prusak (1998/2000, p. 35), trust must be "ubiquitous" and trustworthiness must "start at the top." Thus, trust should not only be vital among team members but also, and particularly, across different hierarchical levels of the organization, such as employees and supervisors (Abrams *et al.*, 2003; Davenport and Prusak, 1998/2000; Pate *et al.*, 2007; Svensson and Wood, 2004). Other organizational variables that lend themselves to a similar manager-worker distinction have been shown to yield valuable information that can help understand their impact in organizations (e.g. Ng and Sorensen, 2008).

We expected that trust in teammates would positively predict transactive memory because people should be more willing to seek and share knowledge if they trust one another. We differentiate between trust in management and trust in teammates because each of these sources of trust is likely to influence work relationships in different ways. If a person does not trust a teammate, they will be reluctant to use their transactive memory because exposing one's own lack of information, knowledge, or inadequate skills might be used against them at a later point, or at least diminish a person's reputation. Moreover, if a person has received faulty information in the past, they might not be willing to address the same coworker again due to uncertainty whether they can trust the information provided. Therefore, if someone is worried about whether they can trust a teammate, they will be less likely to use and to further develop their transactive memory. Thus, trust in teammates should positively influence transactive memory. However, a different assumption has to be made for trust in management. Generally, management will be less involved in day-to-day processes of transactive memory use and development. Therefore, trust in management should have no significant effect on transactive memory. We therefore propose the following hypotheses:

H1a. Trust in teammates will have a positive effect on a person's transactive memory.

H1b. Trust in management will have no significant effect on a person's transactive memory.

To examine both sources of trust, trust in teammates and in management, is crucial to understand the effects of trust on transactive memory and on knowledge management more generally.

Transactive memory and job performance. Identifying factors that improve transactive memory is only important if transactive memory has significant beneficial effects for an organization. Improvement of task performance in laboratory dyads and teams has been shown in multiple studies (e.g. Hollingshead, 1998, 2000; Liang *et al.*, 1995; Moreland *et al.*, 1998; Wegner *et al.*, 1991). Positive effects of transactive memory on job performance have been shown in applied contexts as well

(Akgün *et al.* 2005; Faraj and Sproull, 2000; Lee *et al.*, 2010; Littlepage *et al.*, 2008; Peltokorpi, 2008; Rau, 2005; Zhang *et al.*, 2007). A well-developed transactive memory enables team members to work effectively and should therefore increase team performance. This is due to the fact that a transactive memory system reduces each team members' cognitive burden and helps the team to effectively coordinate different areas of expertise. Therefore, we predicted a positive relation between transactive memory and team performance:

> *H2.* A person's transactive memory will have a positive effect on perceived team performance.

Having a valid and well-organized transactive memory that allows efficient completion of organizational tasks should lead to better performance on the job. Thus, work places where employees have a well-working transactive memory should benefit by being more productive.

Transactive memory and job satisfaction. Furthermore, we examined the effects of trust and transactive memory on a different type of organizational outcome variable, namely job satisfaction. Michinov *et al.* (2008) found that transactive memory predicted job satisfaction and team identification in anesthesia teams. Assuming that knowledge work is important for job satisfaction, we tested more specifically whether an efficiently functioning transactive memory, which enables team members to be productive and achieve goals, might account for higher job satisfaction.

Having a well-working transactive memory also entails possessing valid knowledge of who knows what, knowing how to access this knowledge, and thus being integrated into a social and knowledge network. For the most part, people should experience such a situation as satisfying and gratifying (Rosen *et al.*, 2010; Smith, 2007; Wegner, 1995). Therefore, transactive memory should have a positive effect on job satisfaction:

> *H3.* A person's transactive memory will have a positive effect on job satisfaction.

Above, we argued that trust in teammates should generally have a positive effect on transactive memory but that trust in management should exert no significant influence on transactive memory. However, the effect of trust in management on job satisfaction should be positive. This line of reasoning is in part based on the assertion that management is more influential with regard to general working conditions whereas peers are more relevant to getting the actual job done through knowledge exchange and use of transactive memory systems. Therefore, we propose the following hypothesis:

> *H4.* Trust in management will have a positive effect on job satisfaction.

A summary of all hypothesized associations is displayed in Figure 1.

In the previous sections, we have shown that transactive memory should be influenced by trust in teammates and that transactive memory, in turn, should influence perceived team performance and job satisfaction. In other words, transactive memory can be assumed to be the mediator in a model encompassing trust in peers (as predictor) and both perceived team performance and job satisfaction (as outcomes; Baron and Kenny, 1986). Therefore, we will also test two mediational models in

addition to the relationships presented above and propose the following two
hypotheses:

    H5a. Transactive memory mediates the relation between trust in teammates and
            perceived team performance.

    H5b. Transactive memory mediates the relation between trust in teammates and
            job satisfaction.

Thus, an environment where individuals trust each other seems critical for creating the
best ground for their transactive memory, which in turn will positively influence
organizational outcomes. The mediation model is shown in Figure 2.

Summary and outline of studies
Two studies were conducted to test these hypotheses. In the first study, we gathered a
data sample originating from individuals working full-time or part-time in various
organizations across a large city in the Northeastern USA. In the second study,
we collected data in one specific organization to test the hypotheses in the context of
one particular organization. The comparison of both studies allows us to draw more
general conclusions about the hypotheses. In both studies, data were collected via
self-report questionnaires at one point in time. Two of our constructs, trust and job
satisfaction, are private constructs and can only be assessed reasonably via self-report,
which is why we used self-report measures for both studies. Furthermore, due to the
delicate topic of the survey, we had to assess data anonymously and could not obtain
supervisor-reports or peer-reports for our outcomes. We also chose to survey
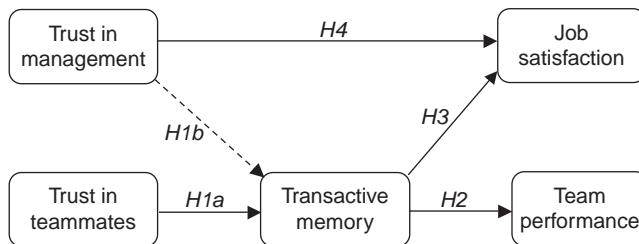
Notes: Full line, prediction of significant relation; dashed line,
prediction of no significant relation
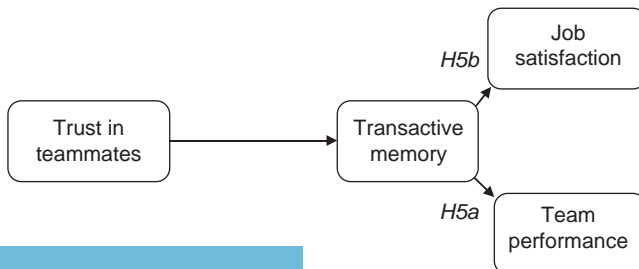
Figure 1.
Model of predicted
relationships

Figure 2.
Model of predicted
mediational effects

individuals instead of groups because we were mainly interested in individuals' perceptions of these phenomena.

Our aim in these studies was to investigate how the effect of trust varies based on the source of trust investigated. We were also interested in understanding the relationship between transactive memory and perceived team performance on the one hand and job satisfaction on the other hand. Results from our studies will contribute to the literature in a number of ways. First, through differentiating two different sources of trust, we aim at resolving some seemingly contradictory results in previous research. Second, we are interested in extending the knowledge base about transactive memory by contributing to the understanding of antecedents and consequences of transactive memory. Finally, we hope to draw conclusions for practitioners that will allow organizations to create conditions that help promote desired effects.

Study 1: cross-organizational sample
For Study 1, we recruited participants from different organizations because the generalizability of our results should be higher when participants in the sample have very different organizational backgrounds.

Method
Participants. Participants were 383 employees (234 females, 145 males, and four missing data on sex) from various organizations across different industries and job types. A total of 49 percent (186) reported being employed full-time, 51 percent (197) reported being employed part-time. Full-time participants had, on average, 52 months of work experience (SD = 64.3), whereas part-time participants had, on average, 18 months of work experience (SD = 18.9). All participants were recruited at a large Northeastern University in the USA. Many students at this university are employed either full-time or part-time because the university serves largely the local community, often first-generation college students, who work besides getting a college degree. Participants' age ranged from 18 to 65 years ($M = 26.9$, SD = 10.6). With regard to racial-ethnic composition of the sample, 32 percent identified as white, 20 percent as black, 17 percent as Hispanic/Latino, 16 percent as Caribbean black/Indian, 10 percent as Asian/Pacific Islander, 4 percent as other, and 1 percent did not respond.

Measures. For all scales, a six-point Likert-type scale (1 = strongly disagree, 6 = strongly agree) was used to indicate the extent of agreement with each item.

Interpersonal trust at work was measured with the Cook and Wall (1980) trust scale. The scale consists of 12 items that measure four dimensions of interpersonal trust at work: faith in intentions of teammates (example item: "If I got into difficulties at work, I know my workmates would try and help me out."), confidence in actions of teammates (example item: "Most of my fellow workers would get on with their work, even if supervisors were not around."), faith in intentions of management (example item: "Management at my organization is sincere in its attempts to meet the workers' point of view."), and confidence in actions of management (example item: "Management can be trusted to make sensible decisions for my organization's future."). A score for trust in teammates was computed by averaging all items from the respective two subscales ($\alpha = 0.87$). A score for trust in management was computed by averaging all items from the other two subscales ($\alpha = 0.86$).

Transactive memory. Transactive memory was assessed using the transactive memory scale (Q-TRACKS; Brauner and Robertson, 2009; Robertson, 2009). The advantage of this scale as compared to other transactive memory scales is that it

differentiates among five dimensions of transactive memory systems that encompass both the individual memory component as well as the social system component of the construct (Ren and Argote, 2011; Wegner, 1986). Derived from the transactive memory literature (Wegner, 1986, 1995), Q-TRACKS is a 20-item Likert-type scale designed to measure the dimensions integration, differentiation, cognitive interdependence, metaknowledge, and transactivity. All scale items can be found in Appendix 1. The integration subscale ($\alpha = 0.75$) measures the degree of shared knowledge between members in a work group or organization. The assumption is that most tasks require some basic level of common knowledge that every team member should possess. Conversely, the differentiation subscale ($\alpha = 0.78$) measures unshared or expertise knowledge in the work group. The underlying assumption is that division of labor leads to having individuals who are experts at particular components of a task, and this expertise knowledge is for the most part unshared among members in the team. The third subscale, the metaknowledge subscale ($\alpha = 0.81$), assesses team members' knowledge of each other's knowledge. Knowing what knowledge is held by which team member means that less time is spent searching for the individual(s) with the required information. A fourth subscale is transactivity ($\alpha = 0.81$), which assesses whether individuals actually access knowledge of other team members through communicative, knowledge-relevant processes. It is important to know "who knows what," but if team members do not use that knowledge, then the team will not function efficiently. The final dimension, cognitive interdependence ($\alpha = 0.72$), measures the degree to which team members rely upon the knowledge held by others to complete a task. It is important for transactive memory systems that individuals utilize the knowledge held by fellow team members when completing the team's task. Subscale indices for Q-TRACKS (integration, differentiation, metaknowledge, transactivity, and cognitive interdependence) were computed by averaging the corresponding items for each subscale. A total score for transactive memory ($\alpha = 0.84$) was computed by averaging all items from the entire scale. High scores on each subscale represent strong transactive memory, low scores represent weak transactive memory. In a previous study, a confirmatory factor analysis supported the five-factor structure and yielded good to excellent convergent as well as discriminant validities (Brauner and Robertson, 2009).

Perceived team performance was measured using an adaptation of the McAllister (1995) job performance measure (based in part on items of Tsui, 1984). Job performance refers to the reputational effectiveness of the individual or team being assessed. The scale consists of four items that measure the assessor's ratings of his or her team's performance. In this context, the items assessed perceived rather than objective performance. The adaptation involved changing the wording of all items to reflect a statement rather than a question. For example, "To what extent has this person met all your expectations in his/her roles and responsibilities?" was changed to "I very much feel that team members have met all of my expectations in their roles and responsibilities." The final score was computed by averaging the respective four items ($\alpha = 0.89$).

Job satisfaction was measured using the Spector (1985) job satisfaction scale. The scale contains 36 items that measure nine facets of job satisfaction: pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, coworkers, nature of work, and organizational communication. Scores on each of nine subscales were computed by averaging the respective four items. One score for overall job satisfaction was computed by averaging all items from the entire scale ($\alpha = 0.92$).

Procedure. Participants were recruited from various campuses of a large Northeastern University. Data were collected in individual or group sessions, with each participant working individually on a questionnaire. Participants from the psychology participant pool received research credit for their participation. All participants were first asked whether they were either currently employed (full-time or part-time) or had worked in the past. Participants were brought into the laboratory, provided with a consent form to read, and after giving consent, they were administered the questionnaire. Upon completion of the questionnaire, participants were debriefed about the study and thanked for their participation.

Individuals who were not recruited through the participant pool were given a copy of the informed consent and questionnaire, and were asked to complete the study at home and return it as soon as possible. They were instructed to contact the experimenter via e-mail or telephone (provided on the consent form) if they had any questions about the survey. All participants were instructed to keep one particular team firmly in mind when completing the questionnaire and respond to all questions with regard to that team. Participants were also instructed not to disclose any identifying information about the team or its members.

Results

Controlling for common method variance (CMV). Because we collected all data from the same sources with the same method, CMV might be an issue in our study. We decided to control for CMV by employing the correlational marker technique proposed by Lindell and Whitney (2001). A detailed description of this technique and our procedure can be found in Appendix 2.

Test of hypotheses. Table I presents descriptive statistics, internal consistencies, and Pearson correlations for all variables.

In all analyses, age, gender, work experience (in months), and employment status (full-time vs part-time) were used as control variables. To assess if multicollinearity was a threat, we estimated the variance inflation factors (VIFs). No variable had a VIF larger than 1.84, which is below the recommended limit of 10.

To test *H1a* and *H1b*, whether trust in teammates and in management had an effect on transactive memory, we ran a hierarchical multiple regression analysis with transactive memory as outcome and both trust in teammates and trust in management as predictors. Results are displayed in Table II. Only trust in teammates, but not trust in management predicted transactive memory: The more one trusted one's teammates, the stronger one assessed the transactive memory of the team. Trust in management, on the other hand, did not affect the assessment of transactive memory. Thus, we found support for *H1a* and *H1b* in the data.

Variable	*M*	SD	1	2	3	4	5
Trust in teammates	4.47	1.03	*0.87*				
Trust in management	4.04	1.18	0.58	*0.86*			
Transactive memory	4.23	0.78	0.50	0.33	*0.84*		
Job satisfaction	3.83	0.85	0.60	0.71	0.45	*0.92*	
Perceived team performance	3.99	1.20	0.70	0.54	0.46	0.62	*0.89*

Table I.
Descriptives, internal consistencies, and Pearson correlations for all variables in Study 1

Notes: Internal consistencies (Cronbach's α) are displayed in the diagonal and printed in italics. All correlations are significant with $p < 0.01$

| | Outcome | | | |
| Predictor | Transactive memory | | Job satisfaction | |
	ΔR^2	B	ΔR^2	B
Step 1 (control variables)	0.00		0.01	
Age		0.04		0.13
Gender[a]		−0.03		−0.03
Work experience (months)		0.02		−0.08
Employment status[b]		−0.001		0.07
Step 2	0.25*		0.55*	
Trust in teammates[c]		0.46 (0.38)*		0.27 (0.16)*
Trust in management[c]		0.08 (0.00)		0.56 (0.49)*
Total R^2	0.25*		0.56*	
n	374		374	

Notes: [a]Gender was coded: 0 = male, 1 = female. [b]Employment status was coded: 1 = full-time, 2 = part-time. [c]To correct of common method variance, we used the correlational marker technique (see Appendix 2). Corrected coefficients are presented in parentheses. *$p < 0.05$

Table II.
Hierarchical multiple
regression analyses
predicting transactive
memory and job
satisfaction from trust in
teammates and trust in
management (Study 1)

To test *H2*, whether transactive memory had an effect on perceived team performance, we ran a hierarchical multiple regression analysis with perceived team performance as outcome and transactive memory as predictor. Results are displayed in Table III. Transactive memory predicted perceived team performance: The stronger one assessed transactive memory, the better one perceived team performance. Thus, we found support for *H2* in our data.

To test *H3*, whether transactive memory had an effect on job satisfaction, we ran another hierarchical multiple regression analysis with job satisfaction as outcome and transactive memory as predictor. Results are displayed in Table III as well. Transactive memory predicted job satisfaction: the stronger one assessed transactive memory, the higher one's job satisfaction. Thus, we found support for *H3* in our data.

| | Outcome | | | |
| Predictor | Team performance | | Job satisfaction | |
	ΔR^2	β	ΔR^2	β
Step 1 (control variables)	0.01		0.01	
Age		0.10		0.13
Gender[a]		−0.03		−0.03
Work experience (months)		−0.10		−0.08
Employment status[b]		0.05		0.07
Step 2	0.23*		0.20*	
Transactive memory[c]		0.48 (0.40)*		0.45 (0.37)*
Total R^2	0.24*		0.21*	
n	374		374	

Notes: [a]Gender was coded: 0 = male, 1 = female. [b]Employment status was coded: 1 = full-time, 2 = part-time. [c]To correct of common method variance, we used the correlational marker technique (see Appendix 2). Corrected coefficients are presented in parentheses. *$p < 0.05$

Table III.
Hierarchical multiple
regression analyses
predicting perceived
team performance and
job satisfaction
from transactive
memory (Study 1)

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To test *H4*, whether trust in management had an effect of job satisfaction, we ran a hierarchical multiple regression analysis with job satisfaction as outcome and trust in management as predictor. To control for trust in teammates, we added it as predictor as well. Results are displayed in Table II. Trust in management predicted job satisfaction: the more one trusted management, the higher one's job satisfaction. Thus, we found support for *H4* in our data.

To test *H5a*, whether transactive memory mediated the relation between trust in teammates and perceived team performance, we used bootstrapping with 1,000 bootstrap samples to find out about the direction and size of the indirect effect leading from trust in teammates to perceived team performance via the mediator transactive memory (see Preacher and Hayes, 2008). The indirect effect is the product of the two coefficients from the direct effect. In this study, the point estimate of the unstandardized indirect effect is 0.10. The 95 percent bias-corrected confidence interval ranges from 0.05 to 0.16 and does not contain 0. The unstandardized direct path leading from trust in teammates to perceived team performance is reduced from 0.82 to 0.72 and remains significant. Overall, this indicates that transactive memory partially mediated the relation between trust in teammates and perceived team performance.

To test *H5b*, whether transactive memory mediated the relation between trust in teammates and job satisfaction, we followed the same procedure. The point estimate of the unstandardized indirect effect is 0.08. The 95 percent bias-corrected confidence interval ranges from 0.05 to 0.13 and does not contain 0. The unstandardized direct path leading from trust in teammates to job satisfaction is reduced from 0.49 to 0.41 and remains significant. These results indicate that transactive memory also partially mediated the relation between trust in teammates and job satisfaction. Thus, we found support for both *H5a* and *H5b* in the data.

Discussion
In a survey study, we examined the relation between trust, transactive memory, perceived team performance, and job satisfaction in a large sample of employees from various organizations. We found that only trust in teammates, but not trust in management increased transactive memory. And transactive memory, in turn, increased perceived team performance and job satisfaction. Mediational analyses showed that transactive memory acted as mediator for the relation between trust in teammates (as predictor) and perceived team performance as well as job satisfaction (as outcomes). Trust in management increased another important outcome, namely job satisfaction. Overall, we found support for all five hypotheses.

One major strength of the study is that the sample consists of a very diverse set of employees regarding organizational background and ethnicity. Thus, it is very likely that results can be generalized to other employees independent of their organizational background. With this strength comes an important limitation, though: employees' organizational backgrounds might have influenced our outcome variables to a certain degree. And because we did not assess these backgrounds, we cannot statistically control for their influence. Furthermore, the majority of employees were relatively young and most had limited experience on the job. Around half of them were employed part-time. In order to overcome these limitations and to replicate our results in a different setting, we conducted Study 2. Conducting a second study in a different setting with different participants is a good test for replicability of results.

Study 2: mono-organizational sample

For Study 2, we recruited participants from only one organization and with more experience on the job. Our goal was to find out whether the results could be replicated with a smaller sample in a specific organization.

Method

Participants. Participants in the mono-organizational sample were 40 employees (26 females, 13 males, and one missing data on sex) recruited from a large finance and planning office in a large organization in New York State. A total of 80 participants had been invited to participate in the study; thus, the response rate was 50 percent. This rate is close to the average response rate of individuals found in organizational survey research (Baruch and Holtom, 2008). A total of 28 (70 percent) participants reported being employed full-time and 12 (30 percent) part-time. Full-time employees had, on average, 8.48 years of work experience (SD = 6.50), whereas part-time employees had, on average, 3.76 years of work experience (SD = 8.29) with this organization. Participants' age ranged from 20 to 76 years (M = 34.78, SD = 14.06). The racial-ethnic composition of the sample was as follows: 35 percent identified as white, 25 percent as black, 10 percent as Asian/Pacific Islander, 10 percent as Hispanic/Latino, 7.5 percent as Caribbean black/Indian, 7.5 percent as other, and 5 percent had missing data on ethnicity.

Measures. The measures used in Study 2 were the same as those used in Study 1. Internal consistencies are reported in Table IV and were generally high.

Procedure. The management of the organization involved in this study was contacted to obtain permission to conduct data collection in the department. As part of the agreement with the organization, department-level feedback was promised to employees and management. Management then contacted all employees via e-mail and inter-office mail to inform potential participants about the study and the possibility of participation. The researchers later contacted employees in each sub-department and carried out several information sessions regarding the study. Participants were informed that participation was completely voluntary, anonymous, and that they could withdraw at any time without penalty. Participants were instructed to complete the questionnaire and respond to all questions with regard to their current work unit or department. They were asked to select their answers as spontaneously and accurately as possible. After the information session, participants were given the questionnaire in a sealable envelope to ensure anonymity. They were instructed that they had one week to complete the questionnaire. The researchers returned after one week to collect the completed questionnaires. In cases

Variable	M	SD	1	2	3	4	5
Trust in teammates	4.78	0.90	0.88				
Trust in management	4.23	1.18	0.50**	0.85			
Transactive memory	4.43	0.74	0.64**	0.33*	0.87		
Job satisfaction	4.16	0.86	0.41**	0.68**	0.41**	0.95	
Perceived team performance	4.69	1.15	0.62**	0.49**	0.44**	0.50**	0.90

Notes: Internal consistencies (Cronbach's α) are displayed in the diagonal and printed in italics. *$p < 0.05$; **$p < 0.01$

Table IV.
Descriptives, internal consistencies, and Pearson correlations for all variables in Study 2

where participants were not finished they were given two more days. After the completion of data collection and preliminary data analysis, feedback at the departmental level was provided to the organization. All information was kept completely anonymous. No identifying information whatsoever was collected from participants.

Results

Controlling for CMV. Similar to Study 1, CMV might be a problem in Study 2. Again, we controlled for CMV by employing the correlational marker technique proposed by Lindell and Whitney (2001) described in Appendix 2.

Test of hypotheses. Table IV presents descriptive statistics, internal consistencies, and Pearson correlations for all variables.

Similar to Study 1, in all analyses, age, gender, work experience (in years), and employment status (full-time vs part-time) were used as control variables. Multicollinearity did not present a threat in this study, because the VIFs for all variables were smaller than 2.55, which is below the recommended limit of 10.

We used the same set of procedures as in Study 1 to test the hypotheses. A hierarchical multiple regression analysis with transactive memory as outcome and both trust in teammates and trust in management as predictors showed that only trust in teammates, but not trust in management predicted transactive memory. Results are displayed in Table V. Thus, we again found support for *H1a* and *H1b*.

Additional hierarchical multiple regression analysis showed that transactive memory predicted perceived team performance and job satisfaction. Results are displayed in Table VI. Thus, we again found support for *H2* and *H3* in our data.

Another hierarchical multiple regression analysis showed that trust in management predicted job satisfaction. Results are displayed in Table V. Thus, we again found support for *H4*.

Finally, we tested with 1,000 bootstrap samples whether transactive memory mediated the relation between trust in teammates and perceived team performance. The point estimate of the unstandardized indirect effect was 0.17, but the 95 percent

| | Outcome | | | |
| | Transactive memory | | Job satisfaction | |
Predictor	ΔR^2	B	ΔR^2	B
Step 1 (control variables)	0.07		0.17	
Age		−0.19		−0.19
Gender[a]		0.20		0.27
Work experience (years)		0.02		−0.10
Employment status[b]		0.15		0.21
Step 2	0.40*		0.42*	
Trust in teammates[c]		0.70 (0.68)*		0.25 (0.19)
Trust in management[c]		0.003 (0.00)		0.55 (0.52)*
Total R^2	0.47*		0.59*	
n	35		35	

Table V.
Hierarchical multiple regression analyses predicting transactive memory and job satisfaction from trust in teammates and trust in management (Study 2)

Notes: [a]Gender was coded: 0 = male, 1 = female. [b]Employment status was coded: 1 = full-time, 2 = part-time. [c]To correct of common method variance, we used the correlational marker technique (see Appendix 2). Corrected coefficients are presented in parentheses. *$p < 0.05$

| | Outcome | | | |
| | Team performance | | Job satisfaction | |
Predictor	ΔR^2	β	ΔR^2	β
Step 1 (control variables)	0.14		0.17	
Age		0.24		−0.19
Gender[a]		−0.01		0.27
Work experience (years)		−0.15		−0.10
Employment status[b]		0.36		0.21
Step 2	0.25*		0.16*	
Transactive memory[c]		0.52 (0.48)*		0.42 (0.38)*
Total R^2	0.39*		0.33*	
n	35		35	

Notes: [a]Gender was coded: $0 =$ male, $1 =$ female. [b]Employment status was coded: $1 =$ full-time,
$2 =$ part-time. [c]To correct of common method variance, we used the correlational marker technique
(see Appendix 2). Corrected coefficients are presented in parentheses. *$p < 0.05$

Table VI.
Hierarchical multiple
regression analyses
predicting perceived team
performance and job
satisfaction from
transactive memory
(Study 2)

bias-corrected confidence interval (−0.18; 0.71) did contain 0. The unstandardized path
leading from trust in teammates to perceived team performance was reduced from
0.91 to 0.74 and remained significant. These results indicate that for this sample,
we cannot conclude that transactive memory mediated the relation between trust in
teammates and perceived team performance.

Then we tested with 1,000 bootstrap samples whether transactive memory
mediated the relation between trust in teammates and job satisfaction. The point
estimate of the unstandardized indirect effect was 0.11 and the 95 percent
bias-corrected confidence interval (−0.14; 0.48) did contain 0. The unstandardized
path leading from trust in teammates to job satisfaction was reduced from 0.49 to 0.38
and become non-significant. Again, we cannot conclude that transactive memory
mediated the relation between trust in teammates and job satisfaction. Overall, we did
not find support for *H5a* and *H5b* in this sample.

Discussion
In Study 2, we attempted to replicate the results from Study 1 in a less diverse
sample from only one organization. We could replicate most results and showed
that trust in teammates is an important predictor for transactive memory and that
transactive memory, in turn, predicts perceived team performance and job
satisfaction. Trust in management, on the other hand, predicted job satisfaction.
In Study 2, however, the results of the mediational tests were less clear. A close
inspection of the size of the respective indirect effects from Study 2 reveals that they
were slightly larger in size to the ones in Study 1. The confidence intervals in Study 2
were much larger as well, though, which might be due to the relatively small
sample size.

The main strength of Study 2 is that it overcomes two major limitations of Study 1:
Employees have the same organizational background and much more experience on
the job. The limitation of Study 2 is that the sample is relatively small, and therefore,
statistical tests have less power. However, Study 2 contributes to our knowledge
because it shows that the results of Study 1 can be replicated and are generalizable to a
different context.

General discussion

Summary

We set out to investigate the relationships between transactive memory, trust in management and teammates, job satisfaction, and team performance using a large cross-organizational sample as well as a small mono-organizational sample. We found confirmation for our assumption that trust in teammates, but not trust in management, influences transactive memory. Consistent with other studies, we also found transactive memory to be a predictor of perceived team performance. Additionally, transactive memory was a predictor of individual job satisfaction. Trust in management predicted job satisfaction as well. Moreover, transactive memory mediated the relation between trust in teammates and perceived team performance and the relation between trust in teammates and job satisfaction in Study 1; however, the results of the mediational tests were not as conclusive for the smaller sample in Study 2. These findings indicate that trust in teammates is more important for working in a team on day-to-day operations, whereas trust in management might be more relevant for organizational outcome variables such as job satisfaction.

Our research was in part motivated by inconclusive results of two previous studies (Akgün *et al.*, 2005; Rau, 2005). To resolve the inconsistency, we differentiated between two sources of trust, namely trust in teammates and trust in management, and their relation to transactive memory and job satisfaction. Our results show that it is indeed critical to distinguish between these two sources (or targets) of trust. Although Davenport and Prusak (1998/2000, p. 35) maintain that trust must be "ubiquitous" and trustworthiness must "start at the top," trusting one's teammates seems to be more relevant to transactive memory than trusting one's bosses. This can be explained by the specific requirements associated with transactive memory. Among coworkers, interaction frequency tends to be higher than across hierarchical levels in an organization. Associated with higher interaction frequency are also more opportunities to learn from each other, which in turn allow for more knowledge exchange and more building of transactive memory. Future research could address these specific questions by explicitly assessing interaction frequency among coworkers and across hierarchies. It could also address the kind of communication that teammates show if they trust each other more or less and how communication impacts transactive memory. Furthermore, it would be interesting to investigate whether differences in interaction frequency or communication can at least in part explain productivity differences across organizations, tasks, or branches.

Strengths

Both studies used reliable measures with high internal consistencies to assess the main variables. With regard to transactive memory, we used a fairly new measure with very good psychometric qualities such as high internal consistencies. We could also confirm results from other studies that used different measures of transactive memory. Despite considerable differences in sample size, population, and work characteristics, we found similar results in both studies, which indicate high conclusion validity (e.g. Beins, 2008). Furthermore, the strengths and limitations of both studies complement each other well, which gives more reason to assume generalizability of the results.

Another important strength of our research is that the results of both studies show the differential effects of trust in teammates vs trust in management. For finishing a knowledge-intensive task in a team, trust in teammates is more important than trust in management because trust influences transactive memory, which, in turn, leads to positive performance outcomes. However, for other organizational outcomes such as job satisfaction, trust in management can be as important as well. Our findings therefore point out the differential importance of soft factors such as trust in organizations. For specific outcomes such as transactive memory and perceived team performance, trust in teammates is important. For a more general outcome such as job satisfaction, trust in management is important.

Limitations
In our data we found support for most hypotheses and therefore also for our overarching model of the relationships between variables (see Figures 1 and 2). However, our data are cross-sectional, which means that we cannot draw conclusive causal inferences as to whether trust has positive consequences or might be a consequence itself: If a transactive memory works well, trust may ensue because past experiences with accessing the expertise of a teammate have yielded consistently good results. Longitudinal studies and laboratory experiments are needed to clarify the causal relations. Also, it is generally desirable to include various sources of data in future studies where possible.

Conclusions and implications
In knowledge economies, as they have been developing over the past decades, valuable contributions of employees depend on sharing knowledge and participating in knowledge exchange and transfer. In other words, they depend on transactive memory systems. Many factors can impact knowledge exchange, including miscommunication, loss of information, or assumptions about available expertise. In addition, intangible factors such as trust (or lack thereof) can affect the intangible resource knowledge. The presence of trust thus strengthens knowledge sharing and transactive memory, which, in turn, can positively impact team performance and job satisfaction. Both our studies have shown that trust plays a crucial role for these critical organizational outcomes (Harter *et al.*, 2010). If employees trust their teammates and their management and are thus satisfied with their job, they should be less likely to seek out other employment; they should show more loyalty, lower absenteeism, and lower turnover rates (Scott and Taylor, 1985). Furthermore, if employees trust their teammates and thus develop stronger knowledge networks and transactive memory systems that enable the flow of knowledge and information, team performance can be positively affected. Thus, our research has shown that transactive memory systems need to be actively improved in work places and strategies for training and development implemented to enable their positive effects. And because they can be positively influenced by trust, leaders, and team members should focus on strengthening trust at the workplace. They can do this, for example, by communicating often and openly, by telling the truth and keeping agreements, and by showing genuine interest in and respect towards all co-workers. Additionally, a focus on common team goals instead of individual goals should support these kinds of behaviors. Even in hard economic times it is therefore crucial for leaders and team members alike to create an environment where intangible factors are attended to because they can influence tangible outcomes. Given our growing knowledge economies, this seems most critical for organizational success.

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Appendix 1. Transactive Memory: Q-TRACKS Items
Integration

(1) All team members have the same level of basic knowledge relevant to our work.

(2) It is important for the work that all team members have the same level of knowledge on relevant subject areas.

(3) Team members have very similar knowledge relating to our work.
(4) All team members bring the same amount of knowledge into the discussion of the group's tasks.

Differentiation

(5) With regard to our work, all team members have their own special area of expertise.
(6) Our team has been put together so that we can complement each other's specific knowledge.
(7) Team members bring a wide spectrum of knowledge from different fields to our group.
(8) We complement each other's specialized knowledge.

Cognitive Interdependence

(9) A successful result can only be achieved by combining our knowledge.
(10) The knowledge of every member is needed in order to work on the task.
(11) I would find it difficult to do my tasks without the suggestions of other group members.
(12) Without the knowledge of the other group members, I wouldn't be able to work as effectively.

Metaknowledge

(13) I usually know to whom to turn when problems occur.
(14) When I think that a particular team member can answer my question, I am usually right.
(15) I know very well who in the team can help me with a particular problem.
(15) If I don't know something, I know whom to ask.

Transactivity

(17) Team members exchange knowledge relevant to their work.
(18) Knowledge is regularly exchanged between the team members.
(19) We often talk with each other about newly gained knowledge (e.g. training, specialized readings).
(20) We frequently talk to each other about how the work is going.

Appendix 2. Controlling for CMV

We controlled for CMV with the correlational marker technique proposed by Lindell and Whitney (2001). In this approach, one partials out shared variance in bivariate correlations that are associated with a specific covariate. One first needs to estimate CMV in a given data set by examining correlations between a so-called marker variable and substantive variables. The marker variable is assumed to be unrelated to at least one substantive variable in the data set, but prone to the same causes for CMV. In the ideal case, it is chosen a priori. Because this marker variable should be unrelated to substantive variables, any correlation between the marker and a substantive variable cannot be due to a true relationship. It must have another cause such as CMV.

This approach is based on the assumption that the correlation between the marker and the substantive variable is based on an unmeasured method factor. The correlation between the marker and the substantive variable should therefore be representative of CMV. One can control for CMV and remove shared variance between the marker and a substantive variable by employing the following equation proposed by Lindell and Whitney (2001):

$$r_{Y.M} = \frac{r_Y - r_S}{1 - r_S} \tag{A.1}$$

In this equation, $r_{Y.M}$ is the partial correlation between two variables corrected for CMV, r_Y is the observed correlation between two variables, and r_S is the smallest observed correlation between

the marker and a substantive variable. The resulting partial correlations are corrected for CMV and should be closer to true correlations than uncorrected ones.

Lindell and Whitney (2001) explain that one can choose a marker variable *post hoc* if an a priori variable was not included in the data set. This *post hoc* marker is the variable with the smallest positive correlation in the data set. Because we had not included an a priori marker variable into our survey, we selected a *post hoc* marker. We chose the variable work method ambiguity. It is one of three sub-components of job ambiguity, which refers to the degree to which employees perceive uncertainty at their workplace (Breaugh and Colihan, 1994). Work method ambiguity was assessed with three items from the Breaugh and Colihan (1994) job ambiguity measure. An example item is: "I know how to get my work done (what procedures to use)." All three items were measured on a six-point Likert-type scale (1 = strongly disagree, 6 = strongly agree). Work method ambiguity should be unrelated to all other variables examined in this study.

In the dataset from Study 1, the smallest correlation between this marker and a substantive variable was the one between the marker and trust in management with $r = 0.13$. Thus, it was used as the basis for all corrections in Study 1. In the dataset from Study 2, the smallest correlation between this marker and a substantive variable was the one between the marker and transactive memory with $r = 0.07$. Thus, it was used as the basis for all corrections in Study 2.

As we tested our analyses within a regression framework, we adjusted the Lindell and Whitney (2001) approach accordingly. We corrected only those coefficients representing the effect of a substantive variable on another substantive variable (as, e.g. the effect of trust on TM). We did not correct those coefficients representing the effect of a control variable (such as age) on a substantive variable because we assume that these control variables could be assessed accurately without measurement error and that correlations between control variables and substantive variables should therefore not be biased by CMV.

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