Predicting Transactive Memory and Investigating the Role of Transactive Memory in an Organizational Context

by

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Abstract

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Knowledge is the most important resource in organizations and the ability to manage that knowledge is important if organizations are to remain competitive in a knowledge driven economy. The study of transactive memory systems in organizations can offer valuable insight into ways of effectively managing knowledge in organizations. The problem with the study of transactive memory systems is that it lacks a generally accepted measure of true nature of transactive memory systems. Previous attempts at designing a reliable and valid measure have been met with some criticisms. The goals of the dissertation are threefold: First, an attempt was made to develop a valid measure of transactive memory based on the Jochmann and Sommer (2002) model of transactive memory. Second, the quality of the measure and its subscales was assessed for construct validity. Thirdly, the newly developed scale was assessed in an applied setting to investigate the relationship between transactive memory and a number of organizational variables never before investigated. Results of Study 1 revealed a five factor model of transactive memory as hypothesized and a scale was developed. The findings of the second study reveal that the scales demonstrate validity. The results of the third study shows that the scale behaves as predicted with regard to a number of newly investigated organizational variables.

Overall, the findings of all three studies take research on transactive memory one step closer to the development of a reliable and valid measure of transactive memory systems in organizations.

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Chapter 1: Introduction and Literature Review

"Airbus Hits Turbulence- How Knowledge Sharing Failures Cost Airbus Euro 4.8 Billion"

> "In December of 2007, Basex, a well known knowledge economy research and advisory firm released its report on the Airbus Company in which it identified both failure to share knowledge and lack of collaboration among its multinational companies as the main factors responsible for the company's loss of its market dominance and $7 billion loss in profits. The Basex report also found that the failures stemmed from many sources, namely that management and productions teams are located in many European companies, lack of insight on the part of some management teams, neglect of its customer's ideas, and reluctance to invest in the latest software. How could Airbus overcome such failures? According to the Basex report Airbus must "focus on building a knowledge-sharing infrastructure that supports enterprise-wide collaboration" (Feintuch, 2007).

Transactive Memory History: Definition of Transactive Memory

Organizations can be viewed as knowledge receptacles and, as the Airbus example illustrates, they should be viewed in this manner if organizations are to thrive in a knowledge economy. The information or knowledge stored in these receptacles can be thought to exist at three levels: the organizational level, group level, and individual level. The manner in which knowledge from all three levels is eventually combined to facilitate the effective functioning of the organization is deeply rooted in the nature of its transactive memory system. The theory of transactive memory was first conceptualized by Wegner, Giuliano, and Hertel (1985) as a framework for understanding the nature of cognitive interdependence in individuals in close relationships. The term transactive memory was initially 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). By

this definition, individuals who are brought together for some specific task and engage in communication with each other are facilitating the development of a transactive memory system. The system works because individuals use each other as external memory stores and through social interaction, mainly communication, knowledge is brought together to better serve the function of the group thereby creating group memory.

Transactive memory systems are information storage systems that emerge through group members' social interaction and develop over time with input, in the form of knowledge expertise, from individual group members (Wegner, 1986). Important to the development and continuance of transactive memory systems is the acceptance of responsibility for knowledge storage on the part of group members. In developing transactive memory systems, individuals are not expected to take individual responsibility for storing all of the knowledge needed by the group, but instead, individual members are expected to accept responsibility for storing knowledge that is within their area of expertise. According to Wegner (1986), transactive memory systems would fail to develop if group members did not accept responsibility for knowledge storage.

Groups that have been in existence for longer periods are more likely to develop an intricate transactive memory system compared to groups in existence for a short period of time. A shared experience was believed to be essential for the development and operation of transactive memory systems. However, Moreland and Myaskovsky (2000) showed that a shared experience obtained through group training was not completely necessary for the development and operation of transactive memory.

Since the original theory of transactive memory, there have been further developments in the field by a number of researchers including Wegner (also see Brauner, 2002; Liang, Moreland, & Argote, 1995; Moreland, 1999; Moreland, Argote, & Krishnan, 1996; Rulke, Zaheer, & Anderson, 1998; Wegner, 1991). Early models of the transactive memory framework relied heavily on research on information processing in individuals, so much so that Wegner, Erber, and Raymond (1991) later adopted a new definition of transactive memory as a shared system for encoding, storing and retrieving information. Communication and the communicative processes still remained important components in the development and modification of transactive memory systems (Wegner et al., 1991). Wegner et al.'s theory of transactive memory systems was not limited to dyads and was also thought to exist in larger groups and organizations. Building on this idea Moreland and colleagues (see Liang et al., 1995; Moreland, 1999; Moreland et al., 1996) pioneered research that extended transactive memory theory to include larger groups. There was, however, some difference between Wegner's theory of transactive memory and Moreland's, which placed emphasis solely on the contents of memory and what people remember, while the important transactive processes (i.e. communicative processes) receded to the background. This shift can be seen in the definition of transactive memory put forward by Moreland and colleagues where transactive memory is viewed as a combination of the knowledge possessed by particular group members and an awareness of who knows what in the group.

The development of transactive memory theory was furthered by researchers (see Anand, Manz, & Glick, 1998; Rulke et al., 1998) who adapted the theory to organizations. The shift, however, from research on dyads and larger groups to

organizations resulted in the replacement of the term transactive memory with that of transactive knowledge despite the fact that theory and overall meaning of the concept remaining unchanged. The use of the term ‘knowledge”, according to Brauner (2002), is appropriate because the focus is mainly on knowledge possessed by individuals not necessarily their memory per se. Rulke and Galaskiewicz (1997, as cited in Rulke et al., 1998) were among the first to adopt the new terminology with their definition of transactive knowledge as an awareness of the skills and potential of individuals embedded in the organizational unit, and the extent to which individuals in the organizational units know where to go to access vital knowledge. According to Rulke et al., awareness of the type of knowledge that is available in the organizational unit is referred to as self knowledge, whereas the second component of the definition, awareness of who knows what or where knowledge resides, is referred to as resource knowledge. Brauner (2002) later followed with a description of transactive knowledge that consisted of the identification of two components, namely an individual component and a collective component. Knowledge that is stored in an individual’s memory constitutes the individual component, whereas the communication and interaction that takes places between individuals constitute the collective component. However, in her investigation of the development and functioning of transactive knowledge systems Brauner emphasizes the influence of both communication processes and group interaction. In this paper the terms transactive memory systems and transactive knowledge systems will be used interchangeably.

Importance of Transactive Memory

The theory of transactive memory offers a plausible explanation for the improved performance of work group members when they all know who knows what or have knowledge of the other members' knowledge. Groups or organizations with a well developed and effectively functioning transactive memory system have a number of advantages. When group members are aware of the different expertise of fellow group members in the organization, planning and coordination of work can be done with increased ease because individuals can anticipate each other's behavior (Moreland, 1999). With an efficient transactive memory system in place, group members are no longer required to memorize all the task-relevant knowledge needed to accomplish their group task. As a result, the cognitive effort or cognitive load required by group members to complete a task is lessened (Brauner, 2002; Moreland, 1999; Wegner et al., 1985). This in turn allows for the individual to specialize in certain task-relevant knowledge areas. It is through this division of labor and expertise that a highly complex task can be better managed with less effort than would be required for one individual alone (Brauner, 2002). What makes the division of labor or expertise effective in transactive memory systems is that group members learn how correctly request information that is needed by name and they also know where (and to who) to go to obtain that information (location information) (Wegner, 1986).

Another advantage of a transactive memory system is that expertise is expanded (Hollingshead, 1998; Wegner, 1986). Given that individuals are no longer responsible for knowing everything about a task, employees can become highly specialized in their work areas and also develop a greater amount of knowledge about their area of specialty. With an increase in the number of group members with specialized knowledge comes the

opportunity for access to more information and, as a result, a group can function more efficiently.

There is, however, a downside associated with transactive memory systems in that efficiency suffers greatly when a member is lost or changed. For instance, if a group member who is responsible for a certain expertise area leaves, the expertise will be lost for the entire group along with the former group member. For example, Lewis, Belliveau, Herndon, and Keller (2005) have demonstrated that membership change can have a negative impact on group performance because the remaining group members tend to rely on the transactive memory structure developed by the old, original group members. A dependence on the old structure results in inefficient transactive processes, which in turn negatively affects performance (Lewis et al., 2005). According to Lewis et al., instructing the remaining group members to reflect upon their own expertise as well as that of the other group members prior to the execution of the task can lead to more efficient transactive processes and better performance.

Another potential drawback of transactive memory occurs when the group disbands and the transactive system is destroyed. This effect can be seen in what Arrow, McGrath, and Berdahl (2000) refer to as task forces or groups. These groups are created to complete a specific task and once the task is completed, the group is dissolved. However, given that the nature of these types of work groups is to accomplish a goal and then dissolve, it can be argued that the disbanding is not necessarily a disadvantage of a transactive memory system. Indeed, a group that no longer exists would not require a transactive memory system.

Transactive Memory Processes

Important to transactive memory systems are the transactive processes that facilitate knowledge sharing between individuals in a workgroup. Transactive memory is achieved through transactive processes; specifically, communication or conversations involving self-disclosure (Hollingshead, 1998a, 1998b; Wegner, 1995). There are differences in opinion among researchers regarding the nature of the underlying processes involved in the development and functioning of transactive memory systems.

Wegner's Transactive Memory Processes

Wegner (1995) identified three transactive memory processes specifically, directory updating, information allocation, and retrieval coordination. To better understand how people use different sources of information to construct and maintain transactive memory directories, these three processes will be explored further.

Directory Updating

Directory updating is the process by which individuals in a group learn about the expertise knowledge that other group members have in their memory stores; in essence the process by which they learn. According to Wegner (1995), directory updating can occur via four different channels: default entries, negotiated entries, expertise entries, and access entries. When we infer that a stranger or new group member has some particular knowledge based on social categorization characteristics (age, sex, race, etc.) then we are said to be using *default entries* to develop directories about others' knowledge. For example, when a group of fathers establishes a coaching team for their kids' soccer program, there will be some assumptions made about which individuals would be best at coaching the various field positions. The tallest dad might be assumed to know best about goalkeeping, the dad who is a fast runner might be assumed to know best about training

the strikers, and the dad who lifts weights at a local gym might be assumed to be knowledgeable about training strategies in defense. Default entries do not necessarily require communication processes as they are generally based on observable characteristics of the individual. As a result, default entries are mainly the product of stereotypical overgeneralizations and are often erroneous (Wegner, 1995).

Once a directory is created, it can be further updated through a method of allocating expertise called negotiated entries. Directory updating though *negotiated entries* involves individuals freely taking on the responsibility for being the storehouse for knowledge in a particular domain. In order to update knowledge directories about fellow group members using negotiated entries, individuals in work groups must engage in communication with each other. Therefore, if the father who was assigned the goalkeeper coaching position accepts responsibility for knowing everything about training goalkeepers, then the coaching responsibility was assigned through negotiated entries.

A third channel for updating one's knowledge directory for individuals in a work group is through *expertise entries*. That is, individuals who are perceived to be experts in a particular knowledge area are assigned responsibility for the knowledge storage. Thus, if the group of fathers assign responsibility for on-the-field training to fathers with experience playing sports in high school or college, whereas those with no sporting experience are assigned the responsibility of purchasing uniforms, scheduling games, and organizing transportation, then assignment of responsibility can be said to be based on individuals perceived knowledge in those areas.

A fourth channel through which transactive memory directories can be updated is through awareness of an individual as a potential source of information. Directory updating by this method is referred to as *access entries*. Thus, assigning the head coaching job to the father who played soccer in high school and college would be an example of updating via access directories. Wegner (1995) posits that access entries can be of three types: primacy, duration, or recency entries. When the person who first encounters a piece of information is later expected to be responsible for keeping and updating that information, then primacy entries are said to be utilized. If, on the other hand, an individual is known to have spent the most time being exposed to a particular type of subject area, then that individual is viewed as the expert and he or she is expected to know most about the topic based on duration entries. Furthermore, recency entries involve the expectation that the person who was last known to have access to a particular piece of information will be able to locate it when later needed by the group.

Information Allocation

The second process that facilitates effective transactive memory functioning is that of information allocation, and it refers to the passing on or assigning of information to individual group members for storage and later retrieval. Incoming information is forwarded to the person with the most well-developed directory structure for storing the much needed information or to the person who is considered to be the expert in that knowledge area (Wegner, 1995).

Retrieval Coordination

Once the information is assigned to the expert, later access to that information requires a third transactive process that Wegner identified as retrieval coordination. This

refers to the planning and coordination that is used to identify the specific knowledge holders and the best manner in which the knowledge should be obtained from the individuals with whom it has been entrusted. Simply put, it involves creating a system that makes it easy to retrieve information from the individuals who were given the responsibility for storing it. Retrieval coordination deals with the issue of organizing the search process during retrieval so as to maximize both the speed of the search and the likelihood of finding the needed information (Wegner, 1995).

Rulke and Rau's Transactive Processes

Rulke and Rau (2000) examined the encoding processes responsible for the development of effective transactive memory systems in groups whose members were trained together. They proposed a five factor model to reflect the transactive encoding process. Building upon the three component model of transactive encoding (i.e. expertise location, coordination, and evaluation) suggested by Wegner (1995), Rulke and Rau developed five categories of group conversation to measure transactive encoding: expertise, no expertise, questioning, coordinating, and evaluations. The *expertise* category refers to the process by which group members either claim to have expertise in a certain domain or, as in the case of the *no expertise* category, claim not to have expertise in a particular knowledge domain. The third category, *questioning*, is the process of asking questions concerning a domain of group members' area of expertise. These first three categories all involve methods to identify and locate the different knowledge domains in the group. Once this information is clarified by all group members, the fourth process, *coordination*, commences. This involves the planning and coordinating of who is going to be responsible for what domain within the group. This coordination ensures that

individuals who are responsible for particular domains will receive all the information within their expertise domain that enters the group. The final process of transactive encoding, *evaluating*, involves assessing the expertise and competence of group members. This allows group members to determine whether individuals are reliable and trustworthy as sources of expertise information.

Brauner's Transactive Processes

Brauner (2006) also modified Wegner's processes and proposed an updated model that identified four processes by which transactive memory systems can develop and function. These four processes all require communication that can occur face-to-face or via some other method of communication (i.e. technology). The first process, referred to as *knowledge disclosure,* involves disclosure on the part of an individual about the expertise knowledge he or she possesses. It is through knowledge disclosure that individuals in a work group learn who knows what and store that information for later use when needed. *Knowledge acquisition,* the second process, involves the incorporation of new knowledge into one's memory along with the ability to demonstrate that this knowledge is easily available for use at later a time. Brauner's third process, *knowledge requisition,* involves the requesting of information from external sources such as other individuals who are known to have the requested information or are known within the group as knowledge stores for that specific type of information. The fourth and final process identified by Brauner is *knowledge allocation* and refers to the distribution of knowledge that needs to be stored for later retrieval, to individuals in the group. Specifically, information is given or assigned to individuals who become responsible for storing it for later use by the group.

Understanding and Assessing the Structure of Transactive Memory

The existence of transactive processes is an indicator of the presence of a transactive structure and vice versa. Transactive processes and transactive structure are intricately intertwined in a transactive memory system, such that transactive processes influence and are influenced by the nature or structure of the transactive memory system. Not surprisingly researchers have proposed various theories to account for the underlying structure of transactive memory systems and they have employed a number of assessment techniques including group memory recall, observed behaviors, and self report measures.

Wegner's Transactive Structure

Wegner et al. (1985), for example, identified two elements that facilitate communication processes in a transactive memory system, namely a differentiated structure and an integrated structure. The *differentiated structure* refers to expertise knowledge held by individual members of a work group. This is knowledge that essentially resides in only one individual and therefore others in the group do not possess this knowledge. The second structure, the *integrated structure*, refers to knowledge that all individuals in a group share or have in common. In order to complete a task effectively, all members of a work group must have some basic level of knowledge and it is that knowledge which forms the integrated structure of transactive memory systems. However, despite the identification of these structural components of transactive memory systems, early transactive memory studies (e.g. Hollingshead, 1998a; 1998b; 2000; 2001;Wegner, et al., 1985, 1991) never actually measured the construct, but instead used group memory recall performance to infer the existence of transactive memory in dyads. For example, in these studies, each participant pair was given a separate category of words to learn and was later asked to recall as many words as possible from the lists.

Moreland and Colleagues Transactive Structure

Other researchers (Liang, et al., 1995; also see Lewis, 2003; Moreland, 1999; Moreland, et al., 1996, 1998) have identified three dimensions assumed to indirectly reflect the operation of transactive memory among individuals in a group. While two of the dimensions, differentiation and credibility, are cognitive in nature, the third, coordination is procedural. The first transactive memory dimension, *memory differentiation*, is similar in nature to the Wegner et al. (1985) differentiation structure and refers to the tendency for group members to specialize in recalling distinct and different aspects of a group's task. This means that members become experts in a particular area of knowledge or have specialized knowledge about a specific aspect of a task.

The second transactive memory dimension, *task credibility*, refers to the level of confidence and trust in the ability of fellow group members to perform their duties in the correct manner. Basically, it is trust that fellow members have the knowledge required to accomplish the task.

The third dimension, *task coordination*, involves the ability of individuals in a group to pool their divergent expertise to complete a task effectively and efficiently. While it is important to have individuals in a group with differing areas of expertise, it is equally important to be able to coordinate these varying areas of expertise to accomplish a task.

Moreland and colleagues used recall measures to assess transactive memory in addition to more direct measures of transactive memory. These direct measures included agreement on self reports about members' expertise and a measure of the three

dimensions believed to be indicators of the presence of transactive memory (i.e. specialization, credibility, and coordination). Moreland and his colleagues had judges, blinded to the hypotheses of their experiments, identify and code for specific behaviors reflecting the three factors they believed were representative of the operation of transactive memory.

The three dimension model proposed by Moreland and colleagues, despite being developed into a scale that was later validated by Lewis (2003), is not without criticism. The issues center on the role of trust in transactive memory systems. Credibility or trust may be important in transactive memory because people use their knowledge about other's knowledge and thereby use transactive memory. Jochmann and Sommer (2002), however, contend that trust is a construct that is empirically different from transactive memory. Dirks (1999), for example, found that groups with higher levels of trust did not necessarily have significantly better group processes and better performance compared to group with low levels of trust.

It is also possible that the role of trust might be that of a moderator of the impact of transactive memory on performance. Dirks and Ferrin (2001) argued that trust moderates the effects of other determinants on attitudinal, perceptual, behavioral, and performance outcomes. Research by Rau (2005) found that trust was not a moderator of the relationship between the location dimension (knowing who knows what) of transactive memory and performance. Chang (2004) found that the degree of social presence (salience of interpersonal relationships) moderated the impact of trust networks on transactive memory systems. The evidence provided here seems to support the claim that trust is not a dimension of transactive memory. To the extent that trust may be

important in transactive memory systems, it is believed that its role might resemble that of a moderator.

As mentioned earlier, using the model proposed by Moreland and colleagues, Lewis (2003) developed and validated a three dimensional transactive memory scale (with specialization, credibility, coordination). A number of limitations, however, are associated with the design of the scale. In particular, the issues surround two items designed to represent the specialization dimension. The first item may not represent the construct of specialization but instead may capture the transactive memory construct that Jochmann and Sommer (2002) refer to as "cognitive interdependence". Cognitive interdependence is the degree to which group members rely upon each other to access information necessary for the completion of the group's task. As can be seen by the wording of the item on the scale (i.e. "The specialized knowledge of several different team members was needed to complete the project deliverables."), it is likely that it is tapping cognitive interdependence as opposed to differentiation. The other problematic item on the Lewis (2003) specialization dimension is believed to be a measure of the transactive memory construct "metaknowledge" referred to by Jochmann and Sommer. Metaknowledge measures individuals' knowledge about others' knowledge. The item: (i.e. "I know which team members have expertise in specific areas."), is arguably a measure of metaknowledge rather than specialization as proposed by Lewis (2003). These issues with the specialization dimension along with the earlier criticism credibility dimension raises questions about the validity of the Lewis (2003) scale as a measure of transactive memory.

Jochmann and Sommer's Transactive Structure

In an attempt to improve understanding of the structure of transactive memory systems, Jochmann and Sommer (2002) identified five dimensions believed to be necessary for the development and existence of transactive memory systems. The five dimensions are differentiation, integration, cognitive interdependence, metaknowledge, and transactivity. Their theory regarding the structure of transactive memory systems represents the first attempt by researchers to create and validate a model of transactive memory using direct empirical evidence.

The first dimension identified by Jochmann and Sommer (2002), *differentiation*, is again similar to that of Wegner et al. (1985) and Moreland (1999) in that it refers to unshared expert or specialized knowledge held by individual members in a group. In almost every group there is information held by individuals that is not available to others, and the differentiation dimension assesses the extent of that unshared knowledge and its impact on the development and functioning of transactive memory systems. Differentiation is important because it reduces the cognitive load on the memory of individuals in a group. Not having to remember all the same information also reduces redundancy of information. With differentiation of knowledge, individuals within the group assume responsibility for a wider expanse of knowledge in a specific area of expertise. In so doing, individuals become experts in those knowledge domains. Increased specialization results in a larger pool of information being made available to group members for completion of the task than would be available if everyone had the same level of knowledge.

The *integration* dimension, also modeled after the integrated structure as hypothesized by Wegner et al. (1985), is the theoretical opposite of the differentiation dimension. The integration dimension assesses the degree of shared knowledge between members in the group. This shared knowledge is often necessary for the completion of tasks. Hinsz, Tindale and Vollrath (1997) noted that in order for groups to operate effectively, there must be some basic level of common or shared knowledge among members. This basic level of shared knowledge is important because it can also serve as a connecting point to the overall task for individuals who vary in their level of expertise. Having shared knowledge is beneficial for a number of reasons, namely shared knowledge enables team members to predict each other's behavior, efficiently use group resources, reduce group conflict, and minimize task completion problems (Hinds & Weisband, 2003).

With the potential access to a large pool of knowledge created by differentiation comes an increased need for group members to have access to the knowledge areas in which they are non-experts. This gives rise to the need for *metaknowledge*, the third dimension of transactive memory identified by Jochmann and Sommner (2002). The metaknowledge dimension assesses individual group members' knowledge about their own knowledge and other group members' knowledge. It is not important that group members know how to do everything themselves but that they know what knowledge is held by their fellow work group members, and where the knowledge can be found when they need access to it. An individual can have two types of metaknowledge: knowledge of one's own knowledge and knowledge of other group members' knowledge.

According to Faraj and Sproull (2003) in order to leverage the potential of specialized knowledge it must be properly managed and coordinated. It is necessary to have a system in place that encourages group members to identify their specific areas of expertise. Knowing who knows what in the group is important for directing group members to individuals who have useful information and also for enabling members to assess the credibility of the source (Moreland, 1999). That is, it allows group members to differentiate between individuals who are true experts from those who possess basic information but are not experts in the area. Credible individuals are expected to provide quality information. Research by Stasser, Stewart, and Wittenbaum (1995) showed that groups with members who are aware of the distribution of knowledge among its members have better performance than groups whose members lack awareness of the knowledge distribution.

The benefits of knowing who knows what in a work group or organization will be greatly diminished if the individuals possessing the information never actually use it to accomplish the group's task. It is for this reason that knowing whether group members are actually using their metaknowledge is important in a transactive memory system. The *transactivity* dimension in the Jochmann and Sommer (2002) model is therefore used to assess information exchange among group members by looking at the communicative processes in groups. Transactivity is important because the benefit of metaknowledge or knowing who knows what will disappear if workers do not use information about the knowledge distribution in the group towards completing the task efficiently. Knowing whether group members are actually using their metaknowledge is very important in a transactive memory system. Information exchange among group members is assessed by

looking at the communicative processes in groups. Communication is important for the development and functioning of transactive memory systems. Recall that Wegner et al. (1985) defined transactive memory in terms of the organized store of knowledge that is contained entirely in the individual memory systems of group members and the set of knowledge relevant transactive processes that occur among group members. Hollingshead (1998b) found that the manner in which knowledge is learned and recalled in transactive memory systems is affected by communication. Dyads remembered more words when they experienced the same communication condition during recall as they did during the learning phases compared to dyads who learned and recalled in different communication conditions.

The fifth dimension proposed by Jochmann and Sommer (2002) recognizes that individuals who work together must not only acknowledge the need to rely on others in order to accomplish the group task but must also use each other's knowledge. This dimension, *cognitive interdependence*, was designed to measure the degree to which group members rely upon each other to access information necessary for the completion of the group's task. In part, transactive memory theory developed out of the recognition that cognitive interdependence is an intricate part of intimacy in close relationships. Individuals need to be aware of the fact that they are dependent upon each other for access to the information stored in the separate memory systems of group members. Wegner et al. (1985) argue that not only are the feelings, emotions, and goals of intimate couples intertwined, but so too are their thoughts. With the application of transactive memory theory to small groups and organizations, the importance of cognitive interdependence remains a key component of the theory. Brauner and Becker (2006)

point out that increasing task complexity in knowledge systems increases the need for cognitive interdependence. The fundamental processes of cognitive interdependence and convergent expectations were found to be key factors in the development of transactive memory structures (Hollingshead, 2001).

Jochmann and Sommer's (2002) model of transactive memory was the first documented attempt to create a reliable and valid measure of transactive memory. They were also the first to employ the use of self-report measures in the assessment of transactive memory in work groups in organizations. There is an important drawback associated with the Jochmann and Sommer measure in that it lacks generalization. The measure was developed in German and its use with a non-German population requires validation.

Austin's Transactive Structure

Another theory that offers a slightly different view of the structure of transactive memory was proposed by Austin (2003) who contends that transactive memory can be conceived of as having four dimensions: group knowledge stock, consensus about knowledge sources, specialization of expertise, and accuracy of knowledge identification. *Group knowledge stock* refers to the knowledge of individual members that is available to the group. This dimension assesses the extent of the knowledge resources available within the group (Austin, 2003). The second dimension, *consensus about knowledge sources,* refers to the extent to which there is agreement among group members about who has what knowledge or, the distribution of knowledge in the group. *Specialization of expertise* refers to knowledge that is held by one member of the group or knowledge that is unique to one member of the group. Again, this dimension bares resemblance to the

differentiated transactive structures first proposed by Wegner (1995), Moreland (1999) and later by Jochmann and Sommer (2002). Austin's fourth dimension of transactive memory, *accuracy of knowledge identification*, refers to the extent to which individuals identified as possessing particular knowledge by others in the group do in fact possess that knowledge.

Austin's theory of transactive memory, however, encounters difficulties because empirical research has failed to support the model. Cruz, Perez and Ramos (2006) tested Austin's theory and found no support for his four dimension model. Forty-Four student teams participated on a competition basis in a business strategy game in which each group was in charge of a company that produces and market spots shoes. Each group's performance was assessed based on the team's decision in competition with other teams. Transactive memory was assessed using Austin's four factor model. In their study, neither group stock knowledge nor the accuracy of knowing who knows what showed a significant impact on team performance. Results also revealed that reaching consensus did not improve performance and, in fact, low consensus teams who did not have to reach consensus showed the best performance. Specialization, however, was significantly related to performance and supported the general consensus that diverse expertise is an important aspect of transactive memory systems.

The previous review revealed that researchers differ in opinions regarding both the nature of the processes that facilitate the development and functioning of transactive memory systems and the structure these systems. It is therefore not surprising that variations exist in the methods used to capture the operation of transactive memory. The problems associated with the models of transactive memory mentioned highlight a

fundamental problem with research in the field, namely that it lacks a reliable model that can serve as the basis for assessing transactive memory systems in work groups and organizations. All previous models recognize that having diverse expertise is an important component of transactive memory systems. With the noted exception of the importance of diverse expertise, the significant differences between the various models of transactive memory speak to the need for the development of a reliable and valid measure of transactive memory. In this regard, the model proposed by Jochmann and Sommer (2002) appears to offer the most promise in gaining a better understanding of transactive memory because it was successfully supported by direct empirical evidence. As mentioned above, the drawback of this model is that it was created for use with German speaking participants. Nonetheless, the Jochmann and Sommer (2002) five-factor model has the potential to assess transactive memory systems effectively and the development of an equivalent English version is an important research goal.

Research on Transactive Memory

Transactive memory research over the years has focused on a number of topics including the impact of assigned structure, the roles of communication (interpersonal and electronic), training, knowledge of expertise distribution, and other social factors (e.g. gender stereotypes, task characteristics, trust). These research topics will be reviewed here.

Assigned Structure

Some of the early research to provide support for transactive memory theory was conducted by Wegner and colleagues (1991) who focused on the knowledge structures developed by couples in close relationships. Research on transactive memory began with

couples because over time, even at this most basic level, couples in close relationships develop a transactive memory system or a shared system for encoding, storing, and retrieving information. Once fully developed and firmly in place such systems guide the interaction and knowledge sharing in the relationship.

Wegner et al. (1991) examined the impact of transactive memory disruption on memory performance by introducing new structures for memory organization in couples who had been in close dating relationships for at least three years. It was expected that an imposed organizational strategy would be more beneficial to impromptu couples because these couples would have to develop a shared system for storing knowledge and access to that knowledge. By contrast natural couples were expected to demonstrate an advantage in recall when not provided with an imposed organizational strategy. Couples were given a memory task that required memorization and later asked to recall items from seven everyday categories with either their partner (natural couples) or with a stranger (impromptu couples). In both groups it was expected that the task would require the use of the couples' transactive memory systems. Some participants performed the memory task by means of an explicit assignment of categories that dictated the word categories to be remembered by each member whereas other participant pairs were not given an imposed structure. The couples who were not assigned expertise were allowed to use whatever system they had in place to remember the items. Assignment of expertise was done arbitrarily and participant pairs were led to believe that that they would be expected to retrieve the information together and be scored for recall as a pair. Participants were given 30 seconds to memorize the words and after a filler task, were individually asked to complete a recall task.

Findings revealed that an imposed organizational strategy on natural couples resulted in significantly fewer recalled items compared to impromptu couples with the same imposed strategy. Natural couples with an imposed strategy also recalled fewer items than natural couples without an imposed strategy. As expected, natural couples without an imposed strategy recalled significantly more items compared to impromptu couples. However, impromptu couples who were given an assigned strategy showed no significant advantage in recall compared to impromptu couples without an imposed strategy. These findings were equivalent for both group and individual recall.

These findings of the study are important because natural couples are believed to have an established transactive memory system due to their high level of cognitive interdependence. Wegner et al. (1991) contended that the poor recall performance of natural couples in the assigned organizational strategy condition is evidence that the imposed organizational strategy inhibited the memory performance of natural couples by interfering with their already existing and well developed implicit arrangement. This well developed implicit arrangement in couples is, in essence, a transactive memory system. The Wegner et al. findings provided support for the theory of transactive memory but left questions unanswered about whether the same set of principles would apply to work groups and organizations. Despite these lingering questions, the paradigm developed and tested by Wegner and colleagues became the foundation for much of the research that followed.

Communication

The dyadic model developed by Wegner and colleagues to investigate the workings of transactive memory systems was adopted by Hollingshead (1998a, 1998b,

1998c) who in a series of studies investigated the role of communication in transactive memory systems. For example, Hollingshead (1998a) conducted two experiments investigating the impact of communication on retrieval processes in transactive memory systems. In the first experiment, she looked at the impact of communication style on couples' performance on a knowledge pooling task. Intimate couples and impromptu couples worked on the knowledge pooling task either face-to-face or via a computer conferencing system that only allowed for text-based communication. Results revealed that intimate couples in the face-to-face condition not only performed significantly better than intimate couples in the computer conferencing condition but they significantly outperformed impromptu couples in the face-to-face condition. There was, however, no significant difference between the intimate couples and the impromptu couples in the computer conferencing system. These findings are important according to Hollingshead (1998a) because they indicate that factors other than awareness of the distribution of expertise, possibly paralinguistic and nonverbal cues, are important in transactive memory systems.

To investigate this further, Hollingshead (1998a) conducted a second experiment to assess the impact of nonverbal communication and paralanguage on transactive memory. Communication was manipulated by either allowing participants to pass notes without visual access, pass notes with visual access, or talk without visual access, whereas paralinguistic communication was manipulated by having participants focus on how something is said rather than on the literal meaning of the spoken words. The findings revealed that intimate couples' performance was significantly better when they had access to nonverbal and paralinguistic communication cues, as was the case in

communication conditions 2 (pass notes/ visual access) and 3 (talk/no visual access), compared to having no access to such cues in condition 1 (pass notes/no visual access). Taken together, the findings of both experiments support not only the importance of having face-to-face communication in transactive memory systems but also the importance of nonverbal and paralinguistic cues in retrieval processes.

In another study, Hollingshead (1998b) examined the impact of restricting communication on transactive memory systems. The communication of intimate and impromptu couples was restricted either during learning or recall on a collective task. Eighty-eight heterosexual couples who had been dating for at least six months were asked to learn and later recall six sets of words from six knowledge domains with either a partner who was a significant other (intimate) or a partner who was a stranger (impromptu) of the opposite sex. For intimate couples the researchers hypothesized that allowing communication during the learning phase would result in significantly fewer recalled words compared to impromptu couples who were also allowed to communicate during the learning phase. Conversely, it was hypothesized that impromptu couples would find communication during the learning phase highly beneficial because they do not have the already established implicit techniques for choosing categories, evident in intimate couples. It was also hypothesized that dyads, whether intimate or impromptu, would recall more words collectively if the communication conditions were the same during recall and learning. Intimate and impromptu dyads with the same communication conditions during learning and recall (i.e. no communication at learning and recall) were expected to outperform similar intimate and impromptu dyads who experienced recall communication conditions that were different from the learning conditions. Results

supported the hypothesis that recall for intimate couples was significantly higher when they were in the no communication condition as compared to the communication condition. When communication was allowed during learning, impromptu couples recalled a significantly greater amount of words compared to intimate couples. The interpretation is that communication during learning disrupted the implicit organizational techniques used by intimate couples in deciding which categories to memorize (Hollingshead, 1998b). Results also indicated that couples did in fact recall more words when the retrieval communication conditions were the same as the learning conditions. According to Hollingshead (1998b), these findings are important because they provide evidence that dyads employ strategies for organizing and storing information that were developed at an earlier learning phase. The results also support Wegner's (1986) contention that communication has a significant role on transactive memory systems.

Brauner (2002) investigated the communication processes responsible for the acquisition of knowledge and generation of transactive knowledge. In particular, Brauner investigated the conversational circumstances that either promote or inhibit the development of transactive knowledge systems and ways of improving the process of knowledge transfer in organizations. In one study, Brauner (2002) investigated the influence of differing cognitive focusing techniques and expertise diversity in the generation of group transactive knowledge. Individuals were either trained to engage in perspective taking or introspection and group members were given either homogeneous or heterogeneous information to help with the completion of the task. Brauner predicted that training group members to focus on the cognition of fellow group members' (perspective taking) rather than their own cognition would lead to greater generation of

transactive knowledge in groups. She also hypothesized that groups with highly diverse expertise would encounter greater difficulty in generating transactive knowledge. Results revealed that groups presented with homogeneous expertise scored significantly higher on both measures of transactive knowledge (accuracy and agreement) compared to groups that received heterogeneous expertise. According to Brauner (2002), these findings support the belief that shared knowledge is an important component necessary for the generation of transactive knowledge, whereas unshared knowledge inhibits the generation of the transactive knowledge. It should be noted that heterogeneity is important to the extent that the task, by nature, requires individuals with a high level of diverse expertise (Brauner, 2002). Similarly, groups trained in perspective taking also scored significantly higher on both measures of transactive knowledge (accuracy and agreement) compared to groups trained in introspection. This finding offers support for the claim that awareness of who know what in your work group important for transactive knowledge systems.

Training

The concept of transactive memory has not been limited to research on assigned structure or communication. A number of researchers have pioneered research on the impact that training can have on the development and functioning of transactive memory systems (see Liang, Moreland, & Argote, 1995; Moreland, 1999; Moreland, Argote & Krishnan, 1996; 1998; Moreland & Myaskovsky, 2000). As one of the earliest studies to apply transactive memory theory to small groups, Liang et al. (1995), investigated whether groups whose members were trained together on a radio assembly task would outperform groups whose members were trained individually. The experiment was

carried out in two phases: a training phase and an assembly phase that occurred one week later. Participants in the individual training condition were not told who their group members would be for the assembly phase, whereas participants in the group training condition expected their group membership to remain the same for the assembly phase. Liang et al. (1995) hypothesized that group members who were trained together would show significantly better performance on task procedure recall (i.e. how well each group remembered the assembly procedures), task accuracy (i.e. how well each group actually assembled the radio) and task speed (i.e. how quickly each group assembled its radio). It was also expected that groups with members who were trained together would develop stronger transactive memory systems than groups with members who were trained individually. Results revealed that groups whose members were trained together remembered significantly more about how to assemble the radio and made significantly fewer errors compared to groups whose members were trained apart. No significant time advantage was found for either group with regard to the speed with which the tasks were completed. Importantly, results also revealed that groups whose members were trained together had significantly stronger transactive memory systems than groups trained individually. Individuals who were trained together were more likely to develop specialized expertise (memory differentiation), coordinate their task activities (task coordination), and trust fellow group members' expertise (task credibility) compared to individuals trained apart. The presence of these transactive factors was taken as evidence of the existence of transactive memory in small groups. The results, however, did not eliminate the possibility that group development or strategic learning could explain the

improved performance observed in groups whose members were trained together (Liang et al., 1995).

In an attempt not only to replicate, but also to evaluate possible alternative explanations for the Liang et al. findings, Moreland and Wingert (as cited in Moreland, Argote, & Krishnan, 1996) conducted a second experiment. The researchers investigated whether the performance advantages of group training were the result of group development or strategic learning rather than development of transactive memory. To test this, they added a third condition similar to the individual training condition but with the addition of a team building exercise. The team building exercise was designed to encourage team development but was conducted after the training to ensure that development of a transactive memory system did not occur. A fourth condition was introduced, this time identical to the group training condition, with the exception that individuals who were trained together were each reassigned to different groups for the testing sessions. Reassignment rendered the transactive memory systems developed during training useless. Results showed that group development scores were significantly higher in the group training and team building conditions than in the individual training and reassignment conditions. Group training was found to have its greatest impact on performance when groups were trained together compared to the other three conditions, which did not differ significantly from each other. The advantage of group training was associated with the development of a stronger transactive memory system. With regard to performance outcomes, as measured by procedural recall and assembly errors, the group training condition was significantly better than the other three conditions. Overall results also showed that in the absence of a well-built transactive memory system, both group

development and strategic learning independently were not adequate enough to improve group performance.

Previous studies by Moreland and colleagues used indirect measures of transactive memory. Moreland, Argote, and Krishnan (1998) conducted a third experiment to assess transactive memory directly using three indices believed to represent the phenomenon, namely the complexity of group members' beliefs about one another, the accuracy of those beliefs, and the level of agreement within each group about the distribution of expertise. The training phase procedures were the same as in Liang et al., (1995). However, at the beginning of the testing phase participants were given 10 minutes to complete a questionnaire on their beliefs about each member's radio building expertise. They were also unexpectedly asked to complete the recall sheet and assemble the radio individually. Asking participants to assemble the radio individually was done to obtain an objective and accurate measure of participants' earlier reported beliefs about fellow group members' expertise. As hypothesized, results showed that the transactive memory measures (i.e. complexity, accuracy, and agreement) were all significantly greater in groups containing members trained together than in groups whose members were trained individually. Moreland et al. also compared the results from indirect measures of transactive memory used in their earlier studies (i.e. memory differentiation, task coordination, and task credibility) with a more direct measure index, and found that they were significantly related suggesting that indirect measures are also valuable for measuring transactive memory. Overall, these findings are taken as evidence that groups with members who are trained together rather than individually develop better transactive memory systems, which in turn leads to a performance advantage.

In another study, Moreland and Myaskovsky (2000) investigated whether the performance advantage observed in groups whose members are trained together was the result of a better communication system that developed during training. As in previous studies participants were either trained to assemble transistor radios as part of a group or individually. A third training condition was added and consisted of individuals who were trained individually but were later given information (written feedback) about the building skills of each group member before the testing phase. In the group training condition, members were allowed to communicate freely with each other as well as with the experimenter. In the individual training and feedback conditions, participants were only allowed to communicate with the experimenter to answer questions about the task. Results showed that participants in both the feedback condition and the group training conditions scored significantly better on the performance and transactive memory measures (i.e. memory differentiation, task coordination, and task credibility) than participants in the individual training condition. When compared to each other, the feedback condition and group training conditions were not significantly different from each other on the performance or transactive memory measures. These findings suggest that the performance benefits are not necessarily due to improved communication between individuals in groups trained together because the feedback group performed equally well having been trained individually and without any communication. Moreland and Myaskovsky, however, did not rule out communication as being important in transactive memory systems, and as Hollingshead and Brandon (2003) duly noted, the written feedback is itself a form of communication. That the group receiving only feedback (about fellow group members skills) performed equally well as the group

trained together, can also be taken as evidence that group training is not necessary for the development of transactive memory systems. Moreland and Myaskovsky concluded that the possibility exists for creating transactive memory systems by merely supplying group members with information about their fellow work members' expertise.

More recently, Prichard and Ashleigh (2007) investigated the impact of team-skills training on transactive memory and performance. Specifically, they hypothesized that teams receiving team-skills training would exhibit higher transactive memory and performance compared to teams that did not receive such training. Team-skills training encompassed a wide range of generic team skills that included training in problem solving, interpersonal relations, goal setting, and role clarification. A total of 16 three-person teams participated with half of the teams receiving team-skills training and the other half receiving no team-skills training. All 16 teams then took part in an AM radio building task similar to Liang et al.'s (1995) study. In the first session, participants were trained to build the radio while the second task required groups to build the radio using the training they received a week earlier. At the beginning of the second session, participants were asked to recall as much as they could about the radio building process; they were then given 30 minutes to complete the radio building task. Results revealed that transactive memory and task performance were significantly higher for groups that received the team-skills training compared to groups that did not receive the training. The authors concluded that training in both task skills and team skills can lead to stronger transactive memory systems. However, they urge that team skills training should first be completed before embarking upon task training if skill training is to develop stronger transactive memory systems.

Knowledge of Expertise Distribution

Some studies have looked at the performance advantages associated with having knowledge about the distribution of expertise within one's work group (see Stasser et al., 1995; Stasser, Vaughan, & Stewart, 2000). These studies, however, did not investigate the direct impact on transactive memory systems of having knowledge about the distribution of expertise. Moreland (1999) was among earliest researchers to acknowledge the importance that knowledge about the distribution of expertise among group members can have on transactive memory systems and group performance. The findings from Moreland and Myaskovsky (2000) reviewed earlier also demonstrated exactly that point by showing that simply providing group members with information about who knows what in the group could lead to the development of transactive memory systems. These findings created a new area of research on transactive memory systems that focused on the importance of having knowledge of expertise distribution.

Hollingshead (2000), for example, examined the effects of perceptions of expertise on individual learning in work relationships. In her study conducted with real life work groups (as opposed to groups created in the laboratory), participants were told that they would work remotely on a task with either a partner who had similar work-related expertise or one with different work-related expertise. They were first given a "partner match" form, which consisted of two columns listing 10 categories for their own expertise and 10 categories for their partner's expertise. Participants were then asked to circle all the categories representing their areas of work-related expertise. Individuals in the similar partner condition were asked to circle for their partners the same categories that they circled for themselves while individuals in the different partner conditions were

asked to circle, for their partners, the categories that they did not circle for themselves. Finally all participants were given 3 minutes to learn words on a list. Hollingshead (2000) hypothesized that individuals who believed that their potential partners had different work-related expertise, would be more likely to learn and recall more information in their own area of expertise whereas individuals who were led to believe that their partners had similar work-related expertise would learn and recall more information outside of their work-related expertise. Results confirmed both hypotheses. Participants recalled significantly more words per expert category when they believed that their partners had different expertise, whereas participants who believed that their partners had similar expertise recalled significantly more words per non-expert category. According to Hollingshead, these findings support the claim that the theory of transactive memory can be applied to work groups. The findings also underscore the important impact that perception of expertise can have on transactive memory systems by effectively guiding the assignment of task responsibilities in work groups and organizations.

The speed with which knowledge of the distribution of expertise is passed on to group members can have a significant influence on the development of transactive memory systems. Rulke and Rau (2000) examined the encoding processes responsible for the development of effective transactive memory systems in groups whose members were trained together. Participants were first trained in a radio building task similar to that used by Liang et al. (1995). Participants were trained either individually or together and those trained together remained in their respective groups. It was expected that groups with high transactive memory scores would show a reduction over time in the frequency with which group members declared expertise knowledge. It was also hypothesized that the

effective encoding patterns of transactive memory development would be exhibited by groups with high scores on transactive memory. As predicted, sentences declaring expertise occurred more frequently during the early periods of group interaction but decreased over time. Sentences evaluating members' expertise increased over time. Groups that were faster at declaring expertise domains had higher levels of group transactive memory. With regard to the encoding patterns, results revealed that transactive encoding occurs in periods of small encoding cycles that begin with either questions about the task or statements indicating no expertise, continue with declarations of expertise and evaluations of members' competence and expertise, and end with efforts to coordinate who does what in the group. These findings are evidence of the distinct advantages that early knowledge of the distribution of expertise can have on the development of effective transactive memory systems.

In another study, Rulke and Galaskiewicz (2000) investigated the impact of knowledge distribution and group network structure on group performance using 39 teams of MBA students in two management simulation games. Teams were arranged into four, five, or six top management personnel teams and placed in charge of a detergent company. Their main objective was to develop a long-range corporate strategy, implement this strategy into operating plans through monthly decisions in marketing, finance and accounting, production, and research and development. The researchers assessed group performance based on the quality of decisions made by competitors and the impact these decisions had on the value of their company stock. Monthly stock prices were calculated for each firm based on a simulation algorithm and stocks were traded publicly on the international Game Stock Exchange. Rulke and Galaskiewicz (2000)

hypothesized that groups with broadly distributed knowledge or lots of shared knowledge would outperform groups composed of individuals with highly specialized knowledge or narrowly distributed knowledge. They also hypothesized that groups composed of individuals with highly specialized knowledge would perform poorly compared to groups with a high degree of shared knowledge when the social network structure was centralized. When the social network structure was decentralized, it was expected that there would be no difference between the two groups. Results showed that the performance of teams with a high degree of shared knowledge was significantly better than for teams with a high degree of specialized knowledge. When group structures were centralized, highly specialized groups performed significantly poorer than groups with much shared knowledge. As predicted, there was no difference between the groups when group structure was decentralized. These findings emphasize the importance of looking at the influence of knowledge distribution on transactive memory systems within the context of group network structure.

Individuals' perceptions of fellow group members' expertise can be influenced by stereotypes in the workplace. Hollingshead and Fraidin (2003) investigated how gender stereotypes held by individuals in a work group influence assumptions made about other group members expertise and the impact this has on the actual distribution of expertise assignments in transactive memory systems. Participants were initially asked to indicate their expertise relative to the average male and female university student on six knowledge categories (two male, two female, and two gender neutral stereotyped categories). Participants were then asked to work on a learning task with an assumed partner with whom they could not communicate or meet. The researchers hypothesized

that male participants would rate themselves as being more knowledgeable than female participants for categories consistent with male stereotypes. The same effect was expected for female participants with respect to categories consistent with female stereotypes. It was also hypothesized that participants with opposite-sex partners would be more likely to assign responsibility for knowledge categories to their partners based on gender stereotypes compared to participants with same-sex partners. Results revealed that, when the categories dealt with male topics, males rated themselves as more knowledgeable compared to females. The same effect was found for females when the categories dealt with female topics. Consistent with the second hypothesis, when males and females believed that their partners were of the opposite sex, they were more likely to assign categories and learn information consistent with gender stereotypes. These findings illustrate the significant influence that gender stereotypes can have on transactive memory systems by facilitating the development of convergent expectations in mixed-sex work groups (Hollingshead & Fraidin, 2003). These convergent expectations, they argue, may direct people to become experts in areas consistent with stereotypes held by group members.

Social Factors Combined: Trust, task characteristics, familiarity etc.

In recent years, researchers have examined the impact of factors other than training, communication, and expertise on transactive memory. Research on transactive memory has also seen a shift away from studying small groups in laboratory settings to studying larger work groups and organizations. Rau (2005) for example, investigated the influence of transactive memory on performance in top management teams as a function of relationship conflict and trust. Individuals in top management teams from 487

commercial banks in Minnesota were asked to complete a questionnaire that included measures of transactive memory, relationship conflict, and trust. Transactive memory was measured on two dimensions: the composition of expertise within the team (diversity and depth of cognitive resources available to group) and awareness of the location of expertise within the team (where in the group is specific knowledge stored). Assessment of diversity of cognitive resources available to the team was done by measuring group members' dispersion in functional background, industry experience and organizational tenure. Depth of cognitive resources was measured as a function of the average industry and organizational experience within the team. Awareness of the location of expertise was assessed by asking participant to identify the two most areas of expertise contributed be each team member and to rate (on a Likert scale 1-7) how knowledgeable each member is in chosen areas.

Rau (2005) hypothesized that awareness of the location of expertise (or the location dimension of transactive memory) would have a negative impact on performance for teams with high levels of relationship conflict and a positive impact on performance for teams with high levels of trust. Findings revealed that top management teams performed significantly better when there were low levels of relationship conflict and when they were aware of the location dimension of transactive memory. However, performance was not significantly better when members were aware of the location dimension of transactive memory and had high levels of trust. Trust was not shown to be a significant moderator in the relationship between the location dimension of transactive memory and performance.

More recently Zhang, Han, Hempel, and Tjosvold (2007) examined the relationship between team characteristics (i.e. task and cooperative goal interdependence), transactive memory, and performance in high-technology firms (telecommunications, electronic engineering, biological engineering, etc.) in China. They hypothesized that team characteristics such as task interdependence, cooperative goal interdependence, and support for innovation would be positively related to transactive memory. Zhang et al. (2007) also hypothesized that transactive memory would be positively related to work team performance. Results from a survey of 104 work teams comprised of three to nine members showed that task interdependence, cooperative goal interdependence, and support for innovation were all significantly positively related to transactive memory systems. The researchers also found that transactive memory was positively related to team performance. Secondary analyses showed that transactive memory was a mediator of the relationship between team characteristics and performance. These findings support the notion that a clear understanding of the need for coordination among group members can have a positive impact on performance by improving groups' transactive memory systems.

In addition to factors such as trust and team characteristics, Akün, Byrne, Kesin, Lynn, and Imamoglu (2007) investigated the relationship between team member stability, proximity, familiarity, interpersonal trust, and communication in transactive memory systems in new development product teams. These factors were all hypothesized to be positively related to the development of transactive memory. Project managers of 27 new product development firms in Turkey were interviewed and given a 56-item survey to complete as part of a roundtable exercise with fellow group members. The study also

examined the influence of task complexity on transactive memory systems in enhancing performance as measured by team learning, speed to market, and new product success. Task complexity was measured with respect to the repetitiveness of the elements (routine) and whether the tasks relied on either established stores of knowledge or required dynamic solutions (knowledge). Each type of task complexity was classified on a scale ranging from low to high complexity.

Results of Akün et al. (2007) revealed that team stability, cognitive-based trust, affect-based trust, and team familiarity were all significant predictors of transactive memory systems. However, team member proximity and communication were not significant predictors of transactive memory systems. The finding that team communication is not a significant predictor of the development of transactive memory in new development product teams is contrary to the findings of Hollingshead (1998a). The finding that familiarity is significantly related to transactive memory support earlier results from Lewis (2004) who also found that familiar members were more likely to develop transactive memory systems. That both measures of trust were found to be related to transactive memory is somewhat surprising given the results of Rau (2005), which showed that trust was not related to transactive memory. The influence of transactive memory systems on team learning, speed-to-market, and new product success was found to be dependent upon task complexity. For high complexity knowledge tasks, the impact of transactive memory systems on project outcomes was less as compared to non routine tasks. For low complexity routine tasks, the impact of transactive memory on speed-to-market and new product success was greater, however, no significant difference was found for team learning.

Summary

This literature review has taken an in-depth look at research on the various factors that influence the development and functioning of transactive memory systems. Research on transactive memory has focused on the performance benefits associated with well-developed transactive memory systems. These performance benefits have been associated with the development and operation of transactive processes in groups and organizations. These studies have also used a variety of methods for capturing and measuring transactive memory (i.e. memory recall, observed behaviors and self-reports). Attempts to fashion a valid and reliable measure of transactive memory have been promising but problems remain. Jochmann and Sommer (2002), for example, successfully developed a measure of transactive memory that was limited in applicability to German speaking participants. A transactive memory measure developed by Lewis (2003) was deemed problematic because it included trust as important dimension of transactive memory despite the findings of Dirk (1999), which showed that high trust in groups did not necessarily translate into better group processes or performance. Attempts by other researchers (see Austin, 2003) have also failed to produce a valid and reliable measure of transactive memory.

Despite the shortcomings of some of the previous assessment, extant studies offer valuable insight that can serve as a guide for future research. As an example the Jochmann and Sommer (2002) provided a good starting point for developing a reliable measure of transactive memory that can be utilized across diverse organizational settings. This paper will present research designed to address the needs of the field by proposing a novel measure of transactive memory along with research on its validation and application in an applied setting. Three studies are reported here with the first study

addressing the scale development (Q-TRACKS) and the second addressing the scale quality. The third study reports the findings of a case study in which the Q-TRACKS was applied in an organizational setting in order to test its applicability in the field where it is intended to be used. There is also a need to investigate the relationship between transactive memory and a number of other important organizational variables (i.e. job satisfaction, job commitment, etc.) in an attempt to gain insight into how they impact, or are impacted by, transactive memory systems.

Chapter 2: Scale Development (Study 1)

Transactive memory, as defined by Wegner et al. (1985), consists of two components: stored knowledge in the memory systems of group members and knowledge relevant transactive processes that occur among group members. Whereas both components are important for the study of transactive memory systems, the second component is often overlooked by researchers. This oversight is reflected in the design of transactive memory measures. As a result, there is a need for a measure that captures both aspects of the original definition of transactive memory. Research by Jochmann and Sommer (2002) represents the first attempt at designing such a measure. Using the same theoretical foundation, this paper presents a model measure of transactive memory that encompasses the two major components of transactive memory as originally conceived by Wegner and colleagues.

The purpose of Study 1 was to identify and select a set of items that would form the basis of an internally consistent transactive memory scale using a U.S. sample. Building on the findings of Jochmann and Sommer (2002), a five factor structure model for the data was hypothesized to include the dimensions of integration, differentiation, cognitive interdependence, metaknowledge, and transactivity. A survey containing 73 transactive memory items was administered to participants in a laboratory setting, all of whom had some form of group work experience. Responses to the 73 items were first screened to eliminate potentially poor items by performing reliability analyses with the items to check for internal consistency. A confirmatory factor analysis was then performed on the remaining items to determine whether a five factor model best fit the data.

Method

Participants

Participants in Study 1 were 254 students (93 males, 160 females, and 1 with missing data on sex) from a Northeastern public university in the United States. Participants ranged in age from 17 to 50 years (M = 20.3, SD = 4.33). Ethnicity data were not collected for participants in this sample. The employment status of participants was as follows: 11% (29) reported being employed full-time, 67% (171) reported being employed part-time, 4% (9) reported being a freelancer, 2% (6) responded "none of the above", and 16% (39) had missing data on employment status. Full-time participants on average reported that the duration of their work group experience [had been in existence for] as an average of 4.13 years (SD = 5.40), whereas part-time participants on average reported a duration of [that their work group had been in existence for] 7.99 years (SD = 14.53).

Materials

The 73 item pool used in the survey was adapted from Jochmann and Sommer's (2002) German version of Q-TRACKS, designed to measure transactive memory. Items were first translated from German to English with the assistance of a translator. The English meanings of the translated items were verified using agreement from multiple independent raters. Participants response to items were recorded on a 6-point Likert scale (1= strongly disagree to 6 = strongly agree). Scores for all scales were averaged to form a composite score for each individual measure.

Jochmann and Sommer initially hypothesized a four factor model that included cognitive interdependence, metaknowledge, and transactivity. The fourth factor consisted of integration and differentiation, which were considered to be polar opposites of the

same factor. However, factor analyses revealed a five factor model of transactive memory, where integration and differentiation loaded on two separate factors. The results of the Jochmann and Sommer analysis led to re-categorization of a number of items in the pool before including them in this study. Despite the re-categorization of items, the proposed five dimension model consisting of the factors integration, differentiation, cognitive interdependence, metaknowledge, and transactivity remained unchanged. The integration dimension of transactive memory is hypothesized to assess the extent to which individuals in a work group have some level of similar knowledge or shared knowledge and as such integration questions (items 1, 2, 3, 4, 5, and 6) were constructed to assess the degree of shared knowledge between members in a work group. A sample integration item is "Group members have very similar knowledge related to our work." Negatively worded items for the complete scale are marked with a ® after the item number (i.e. item 194®) to indicate that they were reverse scored. For reverse coded items, a score of 6 that would normally represent strongest agreement is considered to be equivalent to a score of 1, which represents strongest disagreement on a question that is worded positively. A complete listing all 73 pool items is presented in Appendix A.

The differentiation dimension is hypothesized to measure the extent to which group members have specialized or expert knowledge needed for the completion of the task. Differentiation questions (items 7, 8, 9, 10, 11, 12, 13®, and 14) were constructed to assess the degree of unshared knowledge or expert knowledge that exists in a work group. A sample differentiation item is "Our individual areas of work are clearly separated." For the cognitive interdependence dimension, questions (items 15, 16, 17, 18, 19, 20, 21, 22, 23, 24®, 25, 26, and 27) were designed to measure the degree to which

group members rely on one another to access information. A sample cognitive interdependence item is “All of us benefit from the expert knowledge that individual members have.” The metaknowledge dimension measures group members’ knowledge about other group members’ knowledge base. Questions for the metaknowledge dimension (items 28, 29, 30, 31, 32, 33, 34, 35®, 36®, 37, 38®, 39, 40, 41, 42, 43, 44®, 45, and 46) were designed specifically to assess group members’ knowledge about their fellow coworkers knowledge in their work unit. A sample metaknowledge item is “I know who has which specialized knowledge.” The fifth dimension, transactivity, measures the extent to which group members use and exchange knowledge about their own and others’ knowledge in the completion of the group’s task. Transactivity questions (items 47, 48®, 49®, 50®, 51®, 52, 53, 54, 55, 56, 57, 58®, 59, 60, 61, 62, 63, 64®, 65, 66, 67, 68®, 69®, 70®, 71, 72, and 73®) were constructed to assess the degree of information exchange among members within a work group. A sample transactivity item is “We often talk with each other about newly-gained knowledge (e.g. training, specialist literature).”

Procedure

Participants were recruited via the psychology participant pool. Upon entering the lab, participants were seated at a desk and thanked for volunteering to participate in a study of how groups work together in organizations. They were instructed that the experimenter was interested in learning about how people work with their colleagues, how they know what others know, and how they manage and exchange information in the work place. Participants were informed that they would be asked to complete a questionnaire that would take roughly 60 minutes, for which they would receive one hour

research participation credit. Fifty minutes were allotted for completion of the survey with the remaining 10 minutes for debriefing and answering questions. Participants were instructed to take as much time as they needed and to read the questions carefully. They were also instructed that the accuracy of their responses, not the speed with which they responded, was most important. They were reminded that the questionnaire is not a test and that only their personal opinions were of interest, and therefore they should be as honest as possible. Participants were then given the informed consent document and instructed to read it thoroughly. Once all participants were finished reading the informed consent, the researcher read through the informed consent a second time emphasizing the voluntary nature of participation, the freedom to leave at any time without negative consequences, and the anonymity of participation. Participants who gave informed consent were then instructed to take a minute to think of one particular work group in which they were currently a member or had been a member in the past. They were instructed when filling out the questionnaire, to keep that one particular group firmly in mind and respond to all questions with regard to this particular group. Participants were also instructed not to include any identifying information about who is or was in their group, or which particular group they were thinking about. Upon completion of the questionnaire, participants were debriefed about the study and thanked for their participation. A sample of the questionnaire used in Study 1 is presented in Appendix B.

Results

Data Screening

The goal of Study 1 was to identify and select, from a set of 73 items, questions that would form the basis of an internally consistent transactive memory scale. A series

of reliability analyses were conducted on all of the items representing each individual subscale in an attempt to identify and eliminate items that poorly represented each of the five hypothesized dimensions of transactive memory. Poorly designed items were items that did not correlate with any other variables (or only very few) on a particular subscale. Items that measure the same underlying construct are expected to correlate with each other. Therefore, items that did not correlate with any other variables (or very few) on a particular subscale were not included in the factor analysis. The following items were eliminated from each subscale because their inclusion in the reliability analysis did not result in improving the Cronbach coefficient alphas for each individual scale to the generally accepted value of .7 or greater: Integration items 1 and 4; Differentiation items, 10, 11, 13®, 14; Cognitive Interdependence items 15, 16, 17, 18, 19, 23, 24®, 25, and 26; Metaknowledge items 28, 29, 30, 31, 32, 35®, 36®, 38®, 39, 40, 41, 43, 44®, 45, and 46; Transactivity items 47, 48®, 49®, 50®, 51®, 53, 54, 58®, 59, 60, 61, 62, 63, 64®, 65, 66, 67, 68®, 69®, 70®, 71, 72, and 73®.

Internal Consistency- Item analysis and Reliability

The evaluation of remaining items was accomplished by examining item-total correlations and coefficient alphas for each subscale (DeVillis, 1991). The mean item-total correlations were all ≥.40 for each subscale, indicating moderately strong relationships between items and their subscales. The alpha reliabilities for the integration, differentiation, cognitive interdependence, metaknowledge, and transactivity subscales were acceptable (α = .72, .76, .72, .78, .78, respectively). The internal consistency of the scale was inferred from these results. No further deletions from the subscales were made internally. Cronbach's alpha for the total 20-item scale was .81 (see Table 1).

Table 1. Factor Correlations and Alpha Coefficients for the Q-TRACKS Scale and Subscales

Factor and Number of Items	M[a]	SD	1	2	3	4	5
Differentiation (*n* = *4*)	4.02	1.24	(.76)				
Metaknowledge (*n* = *4*)	5.13	.76		(.78)			
Transactivity (*n* = *4*)	4.64	.97			(.80)		
Integration (*n* = *4*)	4.30	.99				(.72)	
Cognitive Interdependence (*n* = *4*)	3.74	1.06					(.73)
Total Scale (*n* = *20*)	4.34	1.41					(.81)

Dimensionality- Confirmatory Factor Analysis

The structure of the data for this study was assessed using the factor analytic technique in SPSS (Version11.5). Given the theoretical five-factor model suggested by Jochmann and Sommer (2002), confirmatory factor analyses (CFA) were conducted to determine the best fitting model for the data. The item means, standard deviations, and the interitem correlation matrix are presented in Table 2. On a 6-point Likert scale, where 1 = *strongly disagree* to 6 = *strongly agree*, the means ranged from 2.97 (Item 39: "I would find it difficult to do my task without the suggestions of other group members.") to 5.42 (Item 44: "When there is a problem, I usually know who to turn to."). Examination of the correlation matrix indicated that all items correlated ≥|.20| with at least three other items in the matrix (range: 3-11). No interitem correlation exceed $r = .68$, thus indicating no problems with multicollinearity (see Table 2).

A check of the determinant of the R-matrix (.001) revealed that it was greater than the critical value of .00001, also signifying that multicollinearity was not an issue with these data. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy were used to evaluate the strength of the linear association among the 20 items in the correlation matrix. Bartlett's test of sphericity was significant (χ^2 = 1464.468, p = .000), which indicated that the correlation matrix was not an identity matrix and some relationships existed between the variables, thus factor analysis of the data was made possible. The KMO statistic (.80), a measure of sampling adequacy that compares the magnitude of the observed correlations with the magnitude of the partial correlation coefficients, was "meritorious" according to Kaiser (1974, p. 35) criteria. These results all suggest that a factor analysis was appropriate and could be expected to yield common factors.

Table 2. Correlations, Means, and Standard Deviations for 20-item Transactive Memory Scale (Q-TRACKS)

ITEM	$\bar{X}$	SD	INT15	INT16	DIF17	DIF18	DIF19	INT22	DIF24	IND36	IND37	IND39	MET44	MET45	MET48	MET53	TRA59	TRA62	TRA63	INT64	TRA66	IND86
15INT	4.02	1.59	1.0																			
16INT	4.29	1.64	.54	1.0																		
17DIF	4.52	1.57	.05	.06	1.0																	
18DIF	3.59	1.72	.08	-.01	.50	1.0																
19DIF	4.05	1.61	.11	-.03	.45	.48	1.0															
22INT	4.55	1.33	.47	.42	-.07	-.01	-.07	1.0														
24DIF	4.11	1.49	.03	-.06	.40	.47	.39	-.01	1.0													
36IND	4.02	1.63	.05	-.01	.29	.29	.23	-.08	.34	1.0												
37IND	3.84	1.70	.11	.05	.34	.37	.24	.07	.37	.66	1.0											
39IND	2.97	1.61	-.04	-.16	.02	.10	.09	-.07	.15	.34	.34	1.0										
44MET	5.42	.93	.03	-.00	.12	.17	.14	.11	.13	.10	.11	.10	1.0									
45MET	4.79	1.20	.10	.05	.12	.12	.00	.13	.18	.12	.12	.09	.40	1.0								
48MET	5.21	1.03	.11	.08	.21	.17	.12	.18	.23	.09	.08	-.01	.40	.48	1.0							
53MET	5.38	.98	.08	.04	.14	.20	.11	.08	.17	.10	.16	.03	.68	.44	.47	1.0						
59TRA	4.77	1.28	.08	.05	.24	.27	.24	.14	.26	.14	.22	.13	.34	.31	.30	.35	1.0					
62TRA	4.76	1.19	.08	.10	.19	.22	.29	.10	.22	.16	.18	.12	.30	.20	.26	.32	.56	1.0				
63TRA	4.52	1.45	.13	.12	.29	.24	.35	.13	.26	.25	.24	.13	.27	.18	.27	.34	.48	.67	1.0			
64INT	3.42	1.46	.38	.22	.02	.08	.09	.33	.10	.05	.11	-.06	.11	.11	-.01	.09	.09	.16	.18	1.0		
66TRA	4.79	1.34	.08	-.05	.15	.20	.17	.12	.26	.21	.20	.17	.24	.26	.22	.29	.41	.46	.54	.15	1.0	
86IND	3.79	1.61	.02	-.07	.11	.13	.10	.01	.18	.33	.32	.50	.18	.12	.15	.10	.31	.29	.20	.11	.25	1.0

One method for determining the adequacy of extraction and number of factors is to assess the scree plot produced by the analysis (Cattell, 1966). Examination of the scree plot in Figure 1 reveals that there are clearly five factors above the inflection point used to determine the cutoff for the number of factors in the model.

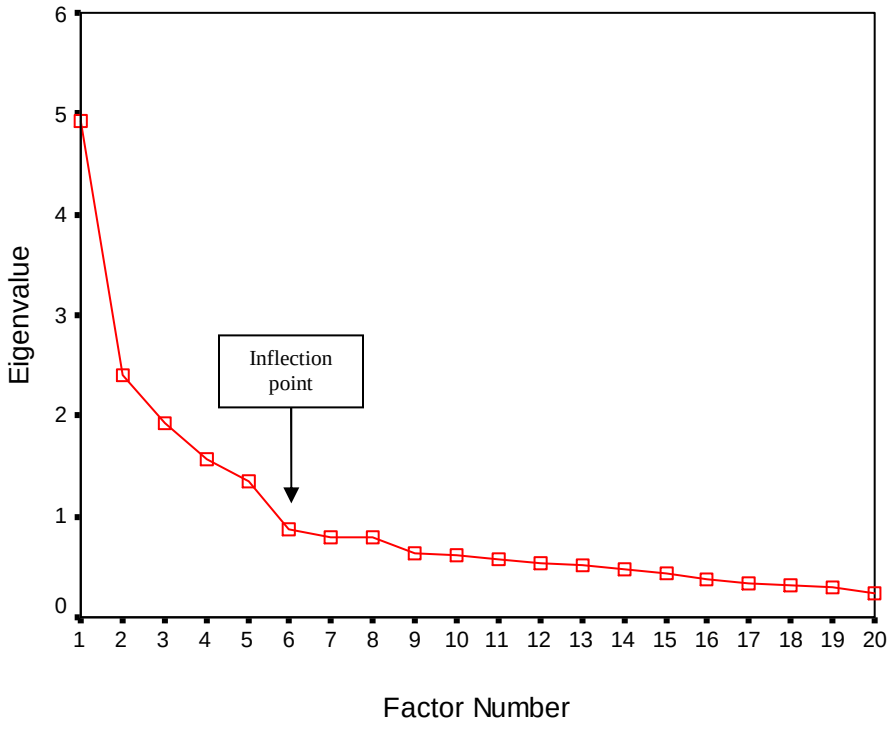

Figure 1. Q-TRACKS Factor Analysis: Scree Plot

In addition to the scree plot method, a second method used to determine the number of meaningful factors produced by the factor analysis is to identify and retain all factors that produce eigenvalues greater than 1 (Field, 2005; Tabachnick & Fidell, 2001). As seen in Table 3, the CFA yielded five factors with eigenvalues greater than 1.

Table 3. Total Variance Explained by the Five Extracted Factors of the Q-TRACKS Scale using a Varimax Rotation

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.930	24.651	24.651	2.102	10.512	10.512
2	2.396	11.982	36.634	2.097	10.483	20.995
3	1.935	9.673	46.306	2.040	10.202	31.197
4	1.578	7.889	54.195	1.743	8.716	39.913
5	1.355	6.773	60.968	1.710	8.549	48.462

A third, supplementary, method for determining whether the selected model is a good model is to look at the reproduced correlations. The reproduced correlation matrix contains the differences between the observed correlation coefficients and those predicted by the model. Small reproduced correlations are a sign of a good model. According to Field (2005), most values in the reproduction correlations should be lower than .05, however, if more than 50% exceed .05, then there is cause for concern. Investigation of the reproduced correlations matrix revealed 23 residuals (12%) that exceeded .05, providing additional support for the five factor model as a good model.

To explore the data and ensure that other possible models did not better explain the data, a number of analyses were conducted in which the number of factors were restricted to 2, 3, 4, and 6. The five factor model, however, was the most consistent model in explaining the data based on the supportive evidence from the scree plot, eigen values and reproduced correlations. For ease, only the five factor model will be discussed in detail here.

CFA-Total Variances Explained

The five factors produced by the CFA together accounted for 48.46% of the variance. Each of the five factors was represented by four items. The first factor, referred

to as differentiation, accounted for 10.51% of the variance (e.g., “With regard to our work, all team members have their own special area of expertise”). The second factor, referred to as metaknowledge, accounted for 10.48% of the variance (e.g., “I know very well who in the team can help me with a particular problem”). The third factor, referred to as transactivity, accounted for 10.20% of the variance (e.g., “Team members exchange knowledge relevant to their work”). The fourth factor, referred to as integration, accounted for 8.72% of the variance (e.g., “All team members have the same level of basic knowledge relevant to our work”). The fifth factor, referred to as cognitive interdependence, accounted for 8.55% of the variance (e.g., “The knowledge of every member is needed in order to work on the task”).

Further clarification of the model suggested by the data can be obtained by considering the factor loadings of individual items on their corresponding hypothesized subscale. A varimax rotation was performed to examine the factor structure of the data. The rotated structure matrix is presented in Table 4. For ease of interpretation, loadings lower than .40 were suppressed and variables were ordered according to loading size from highest to lowest. According to Stevens (1992), a cutoff of .40 is reasonable because a variable should share at least 15% of its variance with the construct it is representing. The rotation of the factor structure clearly reveals that there are five distinct factors, and each variable loads highly onto only one of these factors. Items forming the five factor solution are presented in Appendix C.

Table 4. Rotated Factor Structure Matrix for the 20-item Q-TRACKS: Confirmatory Factoring with Varimax Rotation

	Factors				
QTRACKS Items	**1**	**2**	**3**	**4**	**5**
DIFF-18. Our group has been put together so that we can complement our knowledge.	.687				
DIFF-17. With regard to our work, all members have their own special area of expertise.	.687				
DIFF-19. The group members bring in to the group a wide spectrum of knowledge from different fields.	.622				
DIFF-24. We complement each other's specialized knowledge.	.556				
MET-53. If I don't know something, I know whom to ask.		.815			
MET-44. When there is a problem, I usually know who to turn to.		.755			
MET-45. When I imagine a particular member can answer my question, I am usually right.		.542			
MET-48. I know very well who in the group can help me with a particular question.		.541			
TRA-62. Knowledge is regularly exchanged between the group members.			.787		
TRA-63. We often talk with each other about newly gained knowledge (e.g. training, specialist literature).			.718		
TRA-59. Members exchange knowledge relevant to their work.			.548		
TRA-66. We frequently talk to each other about how the work is going.			.540		
INT-15. All group members have the same level of basic knowledge relevant to our work.				.768	
INT-16. It is important for the task that all group members have the same level of knowledge relevant to our work.				.687	
INT-22. The group members have relatively similar knowledge relating to our work.				.628	
INT-64. The group members all bring the same amount of knowledge into the discussion about the group task.				.437	
IND-36. A successful result can only be reached by combining our specialized knowledge.					.698
IND-37. The knowledge of every member is needed in order to complete the task.					.688
IND-39. I would find it difficult to do my task without the suggestions of other group members.					.565
IND-86. Without the knowledge of other group members I wouldn't be able to work so effectively.					.511

Summary

The purpose of Study 1 was to identify and select a set of items that could be used to form the basis of an internally consistent transactive memory scale using a U.S. sample. Previously proposed models of transactive memory have been deemed problematic because they lack empirical support or do not accurately represent the transactive memory construct (e.g. Austin, 2003; Lewis, 2003; Wegner et al., 1985). Austin's (2003) four factor model of transactive memory was not supported by research. Lewis (2003) successfully validated a three dimension model of transactive memory (specialization, credibility, and coordination) initially developed by Moreland and colleagues. The problem with this model is that the dimension trust is considered to be a construct that is empirically different from transactive memory. Another problem with the Lewis (2003) measure is that two items on the specialization subscale is believed to represent constructs other than specialization. In this study and in accordance with the findings of Jochmann and Sommer (2002), a five factor structure model for the data was hypothesized to include the following dimensions: integration, differentiation, cognitive interdependence, metaknowledge, and transactivity. Results support the earlier findings of Jochmann and Sommer of a five factor model of transactive memory. The scree, eigenvalue, and reproduced correlations tests of the model all support a five factor solution to best explain the data. Rotation of the data using the varimax technique in factor analysis provided additional support for the hypothesized five factor model of transactive memory. Factor loadings for the new scale (Q-TRACKS) were all greater than the cutoff of .40 indicating that each item on a subscale accounted for the minimum percentage of variance (15%) recommended by Stevens (1992). The creation of this

scale represents an important step toward the goal of generating an acceptable measure of transactive memory that can be used in research as well applied settings.

Chapter 3: Assessing Quality of Scale and Establishing Standard Values (Study 2)

The purpose of Study 2 was to assess the quality of the transactive memory scale developed in Study 1 by first assessing the convergent and discriminant validity of the Q-TRACKS subscales and then establishing standard values for the scale, against which comparisons could be made. The assessment of convergent and discriminant validity allows for better insight into the overall construct validity of the measure. Convergent validity assesses the extent to which the measure correlates or converges with other measures of the same or similar constructs. Conversely, discriminant validity assesses whether the measure is distinct from, and does not correlate with, measures of constructs to which it is not expected to be related (Viswanathan, 2005). Individual samples were collected to generate comparison values for transactive memory across a diverse range of organizations. The goal, once convergent and discriminant validity have been assessed, is to determine the average transactive memory scores across as many organizations as possible in order to generate comparison values for transactive memory. The sample also provides insight into the general relation between transactive memory systems and a number of other organizational variables included in this study. As a final goal, the items from the Lewis (2003) specialization measure, which are theorized to represent constructs other than specialization, will be assessed. The item “The specialized knowledge of several different team members was needed to complete the project” will be correlated with the Q-TRACKS cognitive interdependence subscale. Likewise, the item “I know which team members have expertise in specific areas” will be correlated with the Q-TRACKS metaknowledge subscale. It is expected that the each item will demonstrate a significant positive relationship with the respective subscales.

Method

Participants

Participants in Study 2 were 402 students (155 male, 242 females, and 5 with missing data on sex) from the City University of New York in the United States. Participants ranged in age from 18 to 65 years (M = 26.7, SD = 10.5). The breakdown for the highest reported level of education attained by participants was: 9% (35) completed high school, 64% (256) some college (not yet completed), 16% (64) college degree (e.g. B.A. or B.S.), 1% (7) some graduate school (not yet completed), 4% (15) graduate school degree, and 6% (25) with missing data on education. The racial-ethnic composition of the sample was as follows: 20% (81) of the sample identified as Black, 32% (130) identified as White, 10% (39) identified as Asian/Pacific Islander, 17 (68) identified as Hispanic/ Latino, 15% (61) identified as Caribbean Black/Indian, 4% (16) identified as other, and 2% (7) had missing data on ethnicity. The employment status of participants was as follows: 48% (193) reported being employed full-time, 50% (200) reported being employed part-time and 2% (9) had missing data on employment status. Full-time participants on average had 4.24 years of work experience (SD = 5.28), whereas part-time participants on average had 1.50 years of work experience (SD = 1.60).

Measures

A total of 10 scales were used in assessing both convergent and discriminant validity. Scores for all scales were averaged to form a composite score for each individual measure. A number of the original scales used in the study had response formats that varied from either a 5-point Likert scale, a 7-point scale or to a 9-point Likert scale. For the purpose of this study, all scales were standardized to a 6-point Likert scale.

Transactive memory was measured using the transactive memory scale (Q-TRACKS) described in the previous chapter. Q-TRACKS is a 20 item scale designed to measure five dimensions of transactive memory systems, namely integration, differentiation, cognitive interdependence, metaknowledge, and transactivity. The integration subscale measures the degree of shared knowledge between members in a work group or organization. The idea here is that most tasks require some basic level of common knowledge that every group member should possess. Conversely, the differentiation subscale 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 group. The third dimension, cognitive interdependence, measures the degree to which group 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 group members when completing the group's task. A fourth subscale, the metaknowledge subscale, was designed to assess group members' knowledge of each other's knowledge. Knowing what knowledge is held by who in the group means that less time is spent searching for the individual(s) with the information. The final subscale is transactivity, which assesses whether individuals actually use the knowledge about other group members' knowledge in effectively completing the group's task. It is important to know "who knows what", but if group members do not use that knowledge then the group will not function efficiently. Table 5 presents a complete listing of all the items representing each of the Q-TRACKS subscales.

Table 5. 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.
16.	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.

To assess convergent validity the Q-TRACKS subscales was compared with other scales considered to be theoretically similar. Theoretically similar constructs are expected to demonstrate a significantly positive correlation between each other. For four of the five Q-TRACKS measures (i.e. integration, cognitive interdependence, metaknowledge, and

transactivity) there are no known established measures considered to be theoretically identical to these constructs. As a result, measures determined to be somewhat similar to each construct were used to assess convergent validity.

For the Q-TRACKS integration subscale, convergent validity was assessed by correlating that subscale with the Lewis (2003) coordination subscale, which is conceptually closely related. Integration refers to level of shared knowledge or similar knowledge that group members have regarding each other and the task. Coordination, as defined by Lewis (2003), refers to the efficiency with which group members are able to carry out an assigned task. Effective coordination requires at the most basic level shared knowledge about how the task should be accomplished. Therefore, the Q-TRACKS integration scale is expected to correlate positively with the Lewis (2003) transactive memory coordination scale (see Table 6 for coordination items).

Table 6. Transactive Memory- Coordination Items

1.	Our team works together in a well-coordinated fashion.
2.	Our team has very few misunderstandings about what to do.
3.	Our team needs to backtrack and start over a lot. ®
4.	We accomplish the task smoothly and efficiently.
5.	There is much confusion about how we should accomplish tasks. ®

For the Q-TRACKS differentiation subscale, convergent validity was assessed by correlating the scale with a theoretically similar scale, the specialization subscale, also developed by Lewis (2003). The differentiation scale and the specialization scale are considered to be theoretically similar because they were designed to measure the extent to which group members have specialized expertise necessary for the completion of specific aspects of the group's task. Both differentiation and specialization are terms used

to refer to the distribution of expertise within work groups or organizations (see Table 7 for a listing of specialization items). Both the differentiation and specialization subscales are expected to be positively correlated.

Table 7. Transactive Memory- Specialization Items

1.	Each team member has specialized knowledge of some aspect of our project.
2.	I have knowledge about an aspect of the project that no other team member has.
3.	Different team members are responsible for expertise in different areas.
4.	The specialized knowledge of several different team members is needed to complete the project.
5.	I know which team members have expertise in specific areas.

Convergent validity for the Q-TRACKS metaknowledge subscale was assessed by correlating it with an adaptation of the Jain, Sandu, and Sidu (2006) promotion of knowledge sharing measure. Promotion of knowledge sharing refers to group members' awareness of knowledge strategies that exist within the organization as well as the benefits of sharing knowledge. Metaknowledge refers to the extent to which group members have knowledge about each other's knowledge, and this can only take place through sharing. Individuals who engage in the promotion of knowledge sharing are more likely to be aware of the knowledge held by others and its importance for the organization. It is therefore believed that the metaknowledge measure would correlate positively with the promotion of knowledge sharing measure (see Table 8).

Table 8. Promotion of Knowledge Sharing Items

1.	There is growing awareness on the benefit of knowledge sharing in my department.
2.	There exists a knowledge sharing strategy in my department.

Convergent validity for the fourth Q-TRACKS subscale, cognitive interdependence, was assessed by correlating it with Campion, Medsker, and Higgs (1993) interdependence measure. Cognitive interdependence refers to the degree to which group members rely on one another to access information. The Q-TRACKS subscale assesses the degree to which group members rely upon each other for knowledge needed to accomplish the group's task. The Campion, Medsker, and Higgs (1993) interdependence scale is similar in that it assesses the degree to which group members rely upon each other on three dimensions of interdependence: task interdependence, goal interdependence, and feedback and rewards interdependence. Task interdependence refers to the extent to which group members work together and depend on each other to accomplish a task. Goal interdependence refers to the extent to which all work group members' activities are linked to the goals of the work group. Feedback and rewards interdependence refers to the extent to which group feedback and rewards are connected to individual feedback and rewards. Table 9 presents a comprehensive listing of all three categories of interdependence items that are expected to correlate positively with the cognitive interdependence items.

Table 9. Interdependence Items

	Task Interdependence
1.	I cannot accomplish my tasks without information or materials from other members of my team.
2.	Other members of my team depend on me for information or materials needed to perform their tasks.
3.	Within my team, jobs performed by the team members are related to one another.

Table 9. (*Continued*). Interdependence Items

	Goal Interdependence
4.	My work goals come directly from the goals of my team.
5.	My work activities on any given day are determined by my team's goals for that day.
6.	I do very few activities on my job that are not related to the goals of my team.
	Feedback and Rewards Interdependence
7.	Feedback about how well I am doing my job comes primarily from information about how well the entire team is doing.
8.	My performance evaluation is strongly influenced by how well my team performs.
9.	Many rewards from my job (e.g. pay, promotion, etc.) are determined in large part by my contributions as a team member.

Finally, convergent validity of the Q-TRACKS transactivity subscale was assessed by correlating it with the O'Reilly and Roberts (1976) communication scale. Communication, as described O'Reilly and Roberts, refers to information exchange. The communication scale is a ten item scale that measures two sub-components of communication, namely openness and accuracy. Communication openness refers to the ease with which fellow group members talk whereas communication accuracy refers to the truthfulness of the information exchanged between group members. The transactivity subscale of Q-TRACKS measures information exchange in work groups and involves communication therefore is hypothesized to correlate positively with the communication measure. Table 10 presents the items for the two subcomponents of the communication scale.

Table 10. Communication Items

	Openness
1.	It is easy to talk openly to all members of this work unit.
2.	Communication in this work unit is very open.
3.	I find it enjoyable to talk to other members of this work unit.
4.	When people talk to each other in this work unit, there is a great deal of understanding.
5.	It is easy to ask advice from any member of this work unit.
	Accuracy
6.	The information I receive is often inaccurate.
7.	I can think of a number of times when I received inaccurate information from others in this work unit.
8.	It is often necessary for me to go back and check the accuracy of the information I've received.
9.	I sometimes feel that others don't understand the information they have received.
10.	The accuracy of information passed among members of the work unit could be improved

The assessment of convergent validity for the complete Q-TRACKS scale was accomplished by correlating it with the complete Lewis (2003) transactive memory scale. The complete Q-TRACKS scale was comprised of the overall average of the five subscales whereas the complete Lewis (2003) transactive memory scale was comprised of the previously mentioned specialization and coordination scales and a third subscale, credibility. The credibility subscale assesses members' beliefs about the trustworthiness of fellow group members' knowledge. The Lewis (2003) transactive memory scale contains 15 items. Similar to the Q-TRACKS scale, an overall transactive memory score for the complete Lewis (2003) scale was calculated by averaging the scores of the three

subscales. Table 11 presents items for all three subscales of the Lewis (2003) transactive memory measure.

Table 11. Transactive Memory: Lewis (2003) Scale Items

Specialization
1. Each team member has specialized knowledge of some aspect of our project.
2. I have knowledge about an aspect of the project that no other team member has.
3. Different team members are responsible for expertise in different areas.
4. The specialized knowledge of several different team members is needed to complete the project.
5. I know which team members have expertise in specific areas.
Credibility
6. I am comfortable accepting procedural suggestions from the other team members.
7. I trust that other members' knowledge about the project is credible.
8. I am confident relying on the information that other team members bring to the discussion.
9. When other members give information, I want to double-check it for myself. ®
10. I do not have much faith in other members' "expertise". ®
Coordination
11. Our team works together in a well-coordinated fashion.
12. Our team has very few misunderstandings about what to do.
13. Our team needs to backtrack and start over a lot. ®
14. We accomplish the task smoothly and efficiently.
15. There is much confusion about how we should accomplish tasks. ®

Discriminant validity was assessed by comparing the Q-TRACKS subscales with measures considered to be theoretically dissimilar. Recall that discriminant validity involves the demonstration that two constructs, known to be dissimilar, show no relationship to each other or zero correlation between them. Discriminant validity was assessed using both the correlational method and confirmatory factor analysis (CFA). Using the correlational method, it was hypothesized that constructs that were

theoretically dissimilar would demonstrate a zero (or nonsignificant) correlation. With regard to the CFA method, it was expected that items representing theoretically distinct constructs would load on separate factors.

The first discriminant validity assessment was conducted by distinguishing the Q-TRACKS integration subscale from the Lewis (2003) specialization subscale. The specialization scale was used for the discriminant assessment because it assesses the level of unshared knowledge. The specialization scale is therefore the theoretical opposite of the integration scale, which measures shared knowledge and the two measures should not be correlated. A second discriminant validity assessment distinguished the Q-TRACKS differentiation subscale from the Lewis (2003) coordination measure. The item numbers for the specialization and coordination measures were the same as in the convergent validity analysis (see Table 11).

A third discriminant validity assessment involved distinguishing, the Q-TRACKS metaknowledge subscale from the Breaugh and Colihan (1994) job ambiguity measure. Job ambiguity refers to the degree to which employees perceive uncertainty in various aspects of their jobs. The job ambiguity measure contains three sub-components of job ambiguity: work method ambiguity, scheduling ambiguity, and performance criteria ambiguity. Work method ambiguity assesses the degree to which employees have uncertainty regarding the methods or procedures they should used to accomplish their work. The scheduling ambiguity subscale assesses employee uncertainty with regard to the scheduling or sequencing of work activities. Performance criteria ambiguity assesses employees' uncertainty regarding the standards used for determining whether one's job

performance is satisfactory. The items for all three subscales of job ambiguity appear in Table 12.

Table 12. Job Ambiguity Items

Work Method Ambiguity
1. I am certain how to go about getting my job done (the methods to use).
2. I know what is the best way (approach) to go about getting my work done.
3. I know how to get my work done (what procedures to use).
Scheduling Ambiguity
4. I know when I should be doing a particular aspect (part) of my job.
5. I am certain about the sequencing of my work activities (when to do what).
6. My job is such that I know when I should be doing a given work activity.
Performance Criteria Ambiguity
7. I know what my supervisor considers satisfactory work performance.
8. It is clear to me what is considered acceptable performance by my supervisor.
9. I know what level of performance is considered acceptable by my supervisor.

Next, discriminant validity assessment for the Q-TRACKS cognitive interdependence subscale involved distinguishing it from the Campion, Medsker, and Higgs (1993) group level autonomy or self management measure. Group level autonomy refers to the degree to which group members are given the opportunity to participate in making decisions that affect the group. Cognitive interdependence is theoretically different from the construct autonomy and is expected to demonstrate zero correlation with the construct. The items for the autonomy measure are presented Table 13.

Table 13. Self-Management/Autonomy Items

1. The members of my team are responsible for determining the methods, procedures, and schedules with which the work gets done.
2. My team rather than my supervisor decides who does what tasks within the team.
3. Most work-related decisions are made by the members of my team rather than by my supervisor.

Discriminant validity analysis was also assessed for the Q-TRACKS transactivity subscale by distinguishing it from an adaptation of Pines (2005) burnout measure. The adaptation involved changing the wording of the items to fit the study's 6-point Likert scale. For example, "When you think about your work overall, how often do you feel the following: "I've had it" was changed to "I often feel like I've had it". For this study, participants were instructed to answer the burnout questions with respect to their own work experience. An individual's burnout score was calculated for each individual by averaging responses to the 10 items. As recommended by Pines (2005) a score up to 2.4 indicates a very low level of burnout; a score between 2.5 and 3.4 indicates danger signs of burnout; a score between 3.5 and 4.4 indicates burnout; a score between 4.5 and 5.4 indicates a very serious problem of burnout. A score of 5.5 requires immediate professional help. Burnout was used in the assessment because it is known to be a different construct than transactivity and therefore the two measures should not correlate with each other. Burnout items appear in Table 14.

Table 14. Burnout Items

1. I often feel hopeless.
2. I often feel helpless.
3. I often feel depressed.
4. I often feel trapped.
5. I often feel physically weak or sick.
6. I often feel worthless or like a failure.
7. I often feel like "I've had it".
8. I often feel disappointed with people.
9. I often have difficulties sleeping.
10. I often feel tired.

Finally, discriminant validity was assessed for the complete Q-TRACKS scale by distinguishing it from an adaptation of the Jain, Sandu, and Sidu (2006) barriers to knowledge sharing measure. The 13 item measure was adapted from a total of 15 questions designed to measure the extent to which employees are aware of the various factors that hinder knowledge sharing at the individual, group, and organizational levels. Two items from the original scale that were not applicable to research participants in the study were omitted. Perceived barriers to knowledge sharing items are presented in Table 15.

Table 15. Barriers to Knowledge Sharing Items

1. There is a lack of rewards and recognition systems that would motivate people to share their knowledge.
2. There is a general lack of time to share knowledge.
3. There is a lack of formal and informal activities to cultivate knowledge sharing in my department.
4. Existing culture in our department does not provide sufficient support for sharing knowledge.
5. There is a lack of interaction between those who need knowledge and those who can provide knowledge.
6. There is no system to identify the colleagues with whom I need to share my knowledge.
7. Physical work environment and layout of work areas restrict effective knowledge sharing in my workplace.
8. Staff is reluctant to seek knowledge from their seniors because of status fear.

Table 15 (*Continued*). Barriers to Knowledge Sharing Items

9. Staff in my department does not share knowledge because of the fear of it being misused by taking unjust credit for it.
10. It is difficult to convince colleagues on the value and the benefits of the knowledge that I may possess.
11. Staff in my department does not share knowledge because they think 'knowledge is power'.
12. Staff does not share the knowledge because of poor verbal/written communication and interpersonal skills.
13. Information Technology (IT) systems and processes are in place in my department to share knowledge.

Procedure

Participants were recruited via the psychology participant pool, upper level psychology courses, and from friends and family of the researchers and research assistants. The procedure for Study 2 was similar to Study 1, with the exception of the procedure used for non-participant pool individuals. All participants were first asked whether they were either currently employed (full-time or part-time) or have worked in the past. Participants from the psychology pool were brought into the laboratory, provided a consent form to read, and after giving consent, they were administered the questionnaire. Non-participant pool individuals were given a copy of the informed consent and questionnaire, and were asked to complete the study at home and return at their leisure. Non-participant pool individuals were instructed to contact the experimenter via email or telephone (provided on consent form) if they had any questions about the survey. They were instructed to keep one particular group firmly in mind when completing the questionnaire and respond to all questions with regard that group. Participants were also instructed not to disclose any identifying information about the group or its members. Upon completion of the questionnaire, participants were debriefed about the study and thanked for their participation.

Results

Scale Norms- Q-TRACKS

Subscales for Q-TRACKS (i.e. integration, differentiation, metaknowledge, cognitive interdependence, and transactivity) were computed by averaging the corresponding items for each subscale. The corresponding cross-organizational means and standard deviations for each subscale were as follows: Integration (M = 3.83, SD = 1.17), Differentiation (M = 4.04, SD = 1.22), Metaknowledge (M = 5.14, SD = .84), Cognitive Interdependence (M = 3.64, SD = 1.29), and Transactivity (M = 4.52, SD = 1.07). The overall Q-TRACKS transactive memory scale mean for the cross-organizational sample was 4.23 (SD = .74). High scores on each subscale represent high transactive memory.

Convergent Validity

Convergent validity was assessed by computing the correlation coefficients for the Q-TRACKS subscales compared with other measures of the same or similar constructs. As expected, the correlation between the Q-TRACKS measure and the Lewis (2003) transactive measure revealed a significant positive correlation, r (402) = .629, p< .001. Additional convergent validity assessments were conducted for each subscale of the Q-TRACKS. A weak positive statistically significant, relationship was found between integration and coordination (r (401) = .24, p< .01). The differentiation and specialization subscales, also considered to be conceptually similar constructs, were positively related to each other (r (401) = .51, p< .01) to a moderate degree. The correlation between metaknowledge and promotion of knowledge sharing was weak but the direction of the relationship was positive and statistically significant, r (400) = .23, p< .01. A significant positive correlation between cognitive interdependence and

interdependence in the moderate range, r (401) = .44, p< .01, was found. Correlational analysis also revealed a significant, moderate positive relationship between transactivity and communication (r (398) = .45, p< .01). The positive correlations between the Q-TRACKS subscales and other theoretically similar constructs can be taken as evidence indicating convergent validity.

Discriminant Validity

Discriminant validity was assessed using two different methods of evaluation. First, discriminant validity was assessed by comparing scores of individual Q-TRACKS subscales with scores of other measures of dissimilar constructs, using the correlational method. It was expected that constructs that were unrelated and demonstrated discriminant validity would produce a low (or nonsignificant) correlation. Discriminant validity was assessed for each subscale as well as for the complete Q-TRACKS scale. The correlation between the subscales integration and specialization was very close to zero and nonsignificant (r (401) = .04, p = .43) and supported claim that the two scales are indeed distinct. Contrary to expectations, there was a significant positive correlation between differentiation and coordination (r (401) = .23, p < .01), which indicated that the two subscales were related on some level. Similarly, the correlation between metaknowledge and the job ambiguity (work method), although very weak, was statistically significant (r (394) = .15, p< .01). The third discriminant analysis examining the correlation between cognitive interdependence and autonomy was also found to be weak but statistically significant (r (400) = .17, p< .001). The correlation between transactivity and burnout was negative and statistically significant, r (386) = -.16, p< .01, whereas the correlation between the complete Q-TRACKS scale and the barriers to

knowledge sharing scale was negative and significant, r (401) = -.34, p< .01. With the exception of the integration measure, all remaining discriminant analyses for the other Q-TRACKS subscales found either a positive or negative significant relationship between the measures in the comparison. Although the correlations were weak in most cases, the fact they were significant raises some questions about the discriminant validity of the differentiation, cognitive interdependence, metaknowledge, and transactivity subscales and the measures used to compare them.

As a result of inconclusive findings of the correlational method used in the initial discriminant validity analysis, a second more sensitive technique for assessing the discriminant validity of the overall Q-TRACKS and its subscales was employed. Confirmatory factor analyses (CFA) were conducted on the subscale items with items from other constructs that are considered to be theoretically distinct. The dimensionality of the subscales used in the discriminant validity assessments was analyzed using a maximum likelihood factor analysis. Determination of the number of factors to extract was made using the following factors: the a priori hypothesis that the measures were multidimensional, scree test, and the interpretability of the rotated factor solution. Discriminant validity using the factor analytic method can be demonstrated by showing that Q-TRACKS subscale items load on different factors and are thus distinct from other constructs used in the comparison. The CFA models pitted each Q-TRACKS subscale against measures known to be theoretically distinct.

Determination of the number of factors to retain from the factor analysis involved the application of the Kaiser (1960) method of using eigenvalues greater than 1 and Cattell's (1966) Scree test. With the exception of the discriminant validity analysis

between the Q-TRACKS cognitive interdependence scale and the autonomy scale, all other factor analyses revealed two eigenvalues greater than one suggesting that there were only two factors to be extracted from the data being compared.

Confirmatory factor analyses revealed that integration and specialization were indeed distinct factors. The scree plot indicated that the Q-TRACKS integration items were distinct from the Lewis (2003) specialization items, supporting the hypothesis. The rotated solution, as shown in Table 16, yielded two interpretable factors, integration and specialization. The integration factor accounted for 20.4% of the item variance, while the specialization factor accounted for 19.2% of the item variance.

Table 16. Rotated Factor Structure Matrix for Q-TRACKS Integration and Specialization Items (Varimax)

	Factors	
Items	**Integration**	**Specialization**
Q-TRACKS- Integration		
1. Team members have very similar knowledge relating to our work.	.756	
2. All team members bring the same amount of knowledge into the discussion of the group's tasks.	.692	
3. All team members have the same level of basic knowledge relevant to our work.	.656	
4. It is important for the work that all team members have the same level of knowledge on relevant subject areas.	.528	
Lewis (2003)- Specialization		
1. The specialized knowledge of several different team members is needed to complete the project.		.716
2. I know which team members have expertise in specific areas.		.656
3. Each team member has specialized knowledge of some aspect of our project.		.611
4. Different team members are responsible for expertise in different areas.		.489
5. I have knowledge about an aspect of the project that no other team member has.		.405

The second CFA analysis also revealed that the Q-TRACKS differentiation and Lewis (2003) coordination scales measure distinct constructs. The scree plot test indicated the Q-TRACKS differentiation items and the Lewis (2003) coordination items were in fact distinct factors, again supporting the hypothesis. As shown in Table 17, the rotated solution yielded two interpretable factors, differentiation and coordination. The differentiation factor accounted for 24.4% of the item variance whereas the coordination factor accounted for 22.0% of the item variance.

Table 17. Rotated Factor Structure Matrix for Coordination and Q-TRACKS Differentiation Items: (Varimax)

	Factors	
Items	**Coordination**	**Differentiation**
Lewis (2003)- Coordination		
1. We accomplish the task smoothly and efficiently.	.764	
2. Our team works together in a well-coordinated fashion.	.697	
3. Our team needs to backtrack and start over a lot.	.630	
4. There is much confusion about how we should accomplish tasks.	.609	
5. Our team has very few misunderstandings about what to do.	.565	
Q-TRACKS-Differentiation		
1. We complement each other's specialized knowledge.		.839
2. Our team has been put together so that we can complement each other's specific knowledge.		.669
3. Team member bring a wide spectrum of knowledge from different fields to our group.		.663
4. With regard to our work, all team members have their own special area of expertise.		.537

A third CFA analysis revealed that the metaknowledge subscale was a distinct construct from the job ambiguity subscale. The scree plot indicated that our third hypothesis, that the Q-TRACKS metaknowledge items were distinct from the job ambiguity items, was supported. The rotated solution, as shown in Table 18, yielded two interpretable factors, metaknowledge and job ambiguity. The metaknowledge factor

accounted for 33.2% of the item variance, and job ambiguity factor accounted for 29.6% of the item variance.

Table 18. Rotated Factor Structure Matrix for Job Ambiguity and Q-TRACKS Metaknowledge Items: (Varimax)

Items	Factors	
	Job Ambiguity	Meta-knowledge
Job Ambiguity		
1. I know what is the best way (approach) to go about getting my work done.	.981	
2. I know how to get my work done (what procedures to use).	.858	
3. I am certain how to go about getting my job done (the methods to use).	.727	
Q-TRACKS- Metaknowledge		
1. I know very well who in the team can help me with a particular problem.		.825
2. If I don't know something, I know whom to ask.		.768
3. I usually know to who to turn when problems occur.		.604
4. When I think that a particular team member can answer my question, I am usually right.		.582

The scree plot from a fourth CFA, testing the hypothesis that the Q-TRACKS cognitive items were distinct from the autonomy items also confirmed the hypothesis. The scree plot, however, revealed three factors and a three factor CFA was therefore conducted to ensure that items from the two scales did not combine to form a third factor. The CFA along with the rotated solution, as shown in Table 19, yielded three interpretable factors, with two items from cognitive interdependence loading on the first factor, all the autonomy items loading on the second factor, and the remaining two cognitive independence factors loading on a third factor. The first cognitive interdependence factor accounted for 19.9% of the item variance, the autonomy factor accounted for 18.3% of the item variance, and the second cognitive interdependence

factor accounted for 17.8% of the item variance (see Table 20). Given that the autonomy items all loaded on the autonomy factor, and there was no cross loading of items, it was decided to report the two factor loadings in Table 19 as support for the hypothesis that the cognitive interdependence items are distinct from the autonomy items.

Table 19. Rotated Factor Structure Matrix for Autonomy and Q-TRACKS Cognitive Interdependence Items: (Varimax)

Items	Factors	
	Cognitive Interdependence	Autonomy
Q-TRACKS-Cognitive Interdependence		
1. I would find it difficult to do my tasks without the suggestions of other group members.	.797	
2. Without the knowledge of the other group members, I wouldn't be able to work as effectively.	.720	
3. The knowledge of every member is needed in order to work on the task.	.508	
4. A successful result can only be achieved by combining our knowledge.	.450	
Autonomy		
1. Most work related decisions are made by the members of my team rather than by my supervisor.		.735
2. My team rather than my supervisor decides who does what tasks within the team.		.710
3. The members of my team are responsible for determining the methods, procedures, and schedules with which gets done.		.433

Table 20. Rotated Factor Structure Matrix for Autonomy and Cognitive Interdependence Items: (Varimax)

	Factors		
Items	**Cognitive Interdependence**	**Autonomy**	**Cognitive Interdependence**
Q-TRACKS-Cognitive interdependence			
1. Without the knowledge of the other group members, I wouldn't be able to work as effectively.	.991		
2. I would find it difficult to do my tasks without the suggestions of other group members.	.586		
Autonomy			
1. Most work related decisions are made by the members of my team rather than by my supervisor.		.785	
2. My team rather than my supervisor decides who does what tasks within the team.		.678	
3. The members of my team are responsible for determining the methods, procedures, and schedules with which gets done.		.422	
Q-TRACKS-Cognitive interdependence			
1. The knowledge of every member is needed in order to work on the task.			.784
2. A successful result can only be achieved by combining our knowledge.			.691

The Scree plot also supported the fifth hypothesis that the Q-TRACKS transactivity items were distinct from the burnout items. The rotated solution, as shown in Table 21, yielded two interpretable factors, transactivity and burnout. The burnout factor accounted or 37.7% of the item variance and the transactivity factor accounted for 15.9% of the item variance.

Table 21. Rotated Factor Structure Matrix for Burnout and Q-TRACKS Transactivity Items: (Varimax)

Items	Factors	
	Burnout	**Trans-activity**
Burnout		
1. I often feel hopeless.	.865	
2. I often feel helpless.	.843	
3. I often feel depressed.	.840	
4. I often feel trapped.	.835	
5. I often feel physically weak or sick.	.716	
6. I often feel worthless or like a failure.	.709	
7. I often feel like "I've had it".	.680	
8. I often feel disappointed with people.	.661	
9. I often have difficulties sleeping.	.508	
10. I often feel tired.	.469	
Q-TRACKS- Transactivity		
1. Knowledge is regularly exchanged between the team members.		.911
2. Team members exchange knowledge relevant to their work.		.767
3. We often talk with each other about newly gained knowledge.		.687
4. We frequently talk to each other about how the work is going.		.494

An initial two-factor confirmatory factor analysis was conducted on the Q-TRACKS and barriers to knowledge sharing items to test the hypothesis that they are distinct constructs. The scree plot and eigenvalue analysis revealed that an eight factor model best fit the data. A follow up CFA specifying an eight-factor model revealed that the barriers to knowledge sharing items are indeed distinct from the Q-TRACKS items. These findings are taken as support for discriminant validity because there were no cross loadings between the Q-TRACKS items and barriers to knowledge sharing items. The results of both the two factor and eight factor models are presented in Tables 22 and 23 respectively.

Table 22. Rotated Factor Structure Matrix for Barriers to Knowledge Sharing and Q-TRACKS: (Varimax)

	Factors	
Items	**Barriers to Knowledge Sharing**	**Q-TRACKS**
1. There is a lack of interaction between those who need knowledge and those who can provide knowledge.	**.740**	-.167
2. Staff in my department does not share knowledge because of the fear of it being misused by taking unjust credit for it.	**.732**	.020
3. Staff in my department does not share knowledge because they think "knowledge is power".	**.681**	-.049
4. Existing culture in our department does not provide sufficient support for sharing knowledge.	**.668**	-.219
5. It is difficult to convince colleagues on the value and the benefits of the knowledge that I may possess.	**.651**	-.003
6. Staff does not share the knowledge because of poor verbal/written communication and interpersonal skills.	**.639**	-.128
7. Physical work environment and layout of work areas restrict effective knowledge sharing in my workplace.	**.610**	-.043
8. There is no system to identify the colleagues with whom I need to share my knowledge.	**.601**	-.194
9. Staff is reluctant to seek knowledge from their seniors because of status fear.	**.592**	.074
10. There is a lack of formal and informal activities to cultivate knowledge sharing in my department.	**.521**	-.170
11. There is a lack of rewards and recognition systems that would motivate people to share their knowledge.	**.510**	-.094
12. There is a general lack of time to share knowledge.	**.509**	-.126
1. We complement each other's specialized knowledge.	-.089	**.711**
2. Knowledge is regularly exchanged between the team members.	-.322	**.637**
3. Our team has been put together so that we can complement each other's specific knowledge.	-.021	**.626**

Table.22. (*Continued*). Rotated Factor Structure Matrix for Barriers to Knowledge Sharing and Q-TRACKS: (Varimax)

	Factor	
Items	**Barriers to Knowledge sharing**	**QTRACKS**
4. Team members exchange knowledge relevant to their work.	-.298	**.618**
5. Team member bring a wide spectrum of knowledge from different fields to our group.	-.092	**.607**
6. We often talk with each other about newly gained knowledge (e.g. training, specialized readings).	-.300	**.564**
7. A successful result can only be achieved by combining our knowledge.	.131	**.538**
9. The knowledge of every member is needed in order to work on the task.	.152	**.505**
10. With regard to our work, all team members have their own special area of expertise.	-.010	**.495**
11. I know very well who in the team can help me with a particular problem.	-.225	**.425**
12. I would find it difficult to do my tasks without the suggestions of other group members.	.030	**.419**
13. Without the knowledge of the other group members, I wouldn't be able to work as effectively.	.007	**.413**
14. We frequently talk to each other about how the work is going.	-.328	**.403**
15. If I don't know something, I know whom to ask.	-.253	**.362**
16. Information Technology (IT) systems and processes are in place in my department to share knowledge.	-.112	**.317**
17. When I think that a particular team member can answer my question, I am usually right.	-.197	**.311**
18. I usually know to who to turn when problems occur.	-.270	**.308**
19. All team members bring the same amount of knowledge into the discussion of the group's tasks.	-.232	**.286**
20. All team members have the same level of basic knowledge relevant to our work.	-.189	**.200**
21. Team members have very similar knowledge relating to our work.	-.174	**.193**
22. It is important for the work that all team members have the same level of knowledge on relevant subject areas.	-.031	**.117**

Table 23. Rotated Factor Structure Matrix for the Barriers to Knowledge Sharing and Q-TRACKS: 8-Factor Model (Varimax)

	Factors							
	Barriers to Knowledge Sharing		Q-TRACKS					
Items	**(1)**	**(2)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Barriers to Knowledge Sharing - Q-TRACKS items								
1. There is a lack of formal and informal activities to cultivate knowledge sharing in my department.	.771							
2. Existing culture in our department does not provide sufficient support for sharing knowledge.	.710							
3. There is a general lack of time to share knowledge.	.670							
4. There is a lack of interaction between those who need knowledge and those who can provide knowledge.	.646							
5. There is a lack of rewards and recognition systems that would motivate people to share their knowledge.	.614							
6. There is no system to identify the colleagues with whom I need to share my knowledge.	.530							
7. Physical work environment and layout of work areas restrict effective knowledge sharing in my workplace.	.492							
1. Staff in my department does not share knowledge because of the fear of it being misused by taking unjust credit for it.		.837						
2. Staff in my department does not share knowledge because they think "knowledge is power".		.714						
3. Staff is reluctant to seek knowledge from their seniors because of status fear.		.635						
4. Staff does not share the knowledge because of poor verbal/written communication and interpersonal skills.		.597						
5. It is difficult to convince colleagues on the value and the benefits of the knowledge that I may possess.		.568						
1. We complement each other's specialized knowledge.			.774					
2. Team member bring a wide spectrum of knowledge from different fields to our group.			.692					

Table 23. (*Continued*). Rotated Factor Structure Matrix for the Barriers to Knowledge Sharing and Q-TRACKS: 8-Factor Model (Varimax)

	Factors							
	Barriers to Knowledge Sharing		Q-TRACKS					
Items	**(1)**	**(2)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Barriers to Knowledge Sharing - Q-TRACKS items								
3Our team has been put together so that we can complement each other's specific knowledge.			.613					
4. With regard to our work, all team members have their own special area of expertise.			.517					
1. Information Technology (IT) systems and processes are in place in my department to share knowledge.								
2. I know very well who in the team can help me with a particular problem.				.782				
3. If I don't know something, I know whom to ask.				.752				
4. I usually know to who to turn when problems occur.				.587				
5. When I think that a particular team member can answer my question, I am usually right.				.578				
1. Team members have very similar knowledge relating to our work.					.729			
2. All team members bring the same amount of knowledge into the discussion of the group's tasks.					.665			
3. All team members have the same level of basic knowledge relevant to our work.					.661			
4. It is important for the work that all team members have the same level of knowledge on relevant subject areas.					.549			

Table 23. (*Continued*). Rotated Factor Structure Matrix for the Barriers to Knowledge Sharing and Q-TRACKS: 8-Factor Model (Varimax)

	Factors							
	Barriers to Knowledge Sharing		Q-TRACKS					
Items	**(1)**	**(2)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Barriers to Knowledge Sharing - Q-TRACKS items								
1. Knowledge is regularly exchanged between the team members.						.777		
2. Team members exchange knowledge relevant to their work.						.619		
3. We often talk with each other about newly gained knowledge (e.g. training, specialized readings).						.534		
4. We frequently talk to each other about how the work is going.								
1. Without the knowledge of the other group members, I wouldn't be able to work as effectively.							.759	
2. I would find it difficult to do my tasks without the suggestions of other group members.							.737	
1. A successful result can only be achieved by combining our knowledge.								.634
2. The knowledge of every member is needed in order to work on the task.								.566

Correlations

Finally, correlation analyses designed to test the hypothesis that the Lewis (2003) specialization item "The specialized knowledge of several different team members was needed to complete the project" was significantly correlated with the Q-TRACKS cognitive interdependence subscale revealed a statistically significant, moderate positive relationship between the item and the subscale, r (401)= .44, $p < .01$. Similar analyses designed to test the hypothesis that another Lewis (2003) specialization item "I know which team members have expertise in specific areas" would be correlated with the Q-TRACKS metaknowledge subscale also revealed a significant, moderate positive relationship between the item and the subscale, r (400)= .43, $p < .001$. Correlational analyses comparing the three remaining Lewis (2003) specialization items to the Q-TRACKS differentiation scale revealed that the items from the two scales demonstrated a significantly moderate positive relationship, r (400)= .48, $p < .001$.

Summary

The purpose of Study 2 was to validate the transactive memory scale developed in Study 1 by first assessing the convergent and discriminant validity of the Q-TRACKS subscales and then by establishing standard values for the scale, against which comparisons could be made. Assessments of both the convergent and discriminant validity of the Q-TRACKS subscales as well as the complete scale demonstrated the construct validity of the measures. In the assessment of the convergent validity of the overall Q-TRACKS scale, a strong positive correlation was found when correlated with the Lewis (2003) transactive memory measure. Discriminant validity analysis for the overall Q-TRACKS scale also demonstrated that the scale was theoretically distinct from the barriers to knowledge sharing measure and is therefore likely a measure of transactive

memory, as hypothesized. Assessment of the convergent validity of the Q-TRACKS integration subscale revealed a weak positive relationship with the coordination measure. It should be noted, however, that the relationship was statistically significant. Results from the discriminant validity analysis of integration were more straightforward as integration and specialization were shown to be two distinct measures. With regard to convergent validity for the Q-TRACKS differentiation subscale, results revealed that the scale was positively related to the somewhat similar Lewis (2003) specialization scale. Analyses to determine discriminant validity of the differentiation subscale were also successful.

A statistically significant, weak positive relationship was found for the Q-TRACKS metaknowledge subscale when compared to the promotion of knowledge sharing scale in a convergent validity assessment. However, a confirmatory factor analysis of the metaknowledge subscale clearly demonstrated discriminant validity. Convergent validity for the Q-TRACKS cognitive interdependence subscale revealed a moderate, positive relationship with a separate interdependence measure. A similar moderate, positive relationship was found for the Q-TRACKS transactivity subscale when compared with the communication measure. With regard to discriminant validity, the hypothesis that both cognitive interdependence and transactivity are distinct measures was confirmed.

Standard values (i.e. mean, standard deviations) for each Q-TRACKS subscale as well as the overall scales were successfully generated. In addition, Study 2 also examined the relationship between the Q-TRACKS measure and a number of organizational

variables. However, in an attempt to reduce the redundancy of information these relationships will be reported and discussed in a more interpretable context in Study 3.

Finally, as hypothesized, the Lewis (2003) specialization item "The specialized knowledge of several different team members was needed to complete the project" was significantly correlated with the Q-TRACKS cognitive interdependence subscale. Likewise, a second Lewis (2003) specialization item "I know which team members have expertise in specific areas" was correlated with the Q-TRACKS metaknowledge subscale, as hypothesized. The correlations in both cases were moderate and positive. These findings lend support to the claim that the Lewis specialization measure is not an accurate measure of specialization given that two of the items were closely related to other constructs.

Chapter 4: Q-TRACKS Field Assessment: A Case Study (Study 3)

The purpose of Study 3 was to assess the Q-TRACKS scale in an applied setting and evaluate how this transactive memory measure relates to other constructs or measures of organizational behavior. The relationship between transactive memory and a number of the organization behavior measures (i.e. commitment, perceived organizational support, and job satisfaction) has not previously been subject to empirical investigation. To date, a large portion of the research on transactive memory has focused on the relationship between transactive memory and job performance. This study provides much needed insight into the relationship between transactive memory and other important organizational variables including commitment, perceived organizational support, and job satisfaction. Interpretation of the case study results will be made by comparing the obtained findings to those collected from the cross-organizational sample in Study 2. The cross- organizational sample includes individuals from a diverse range of occupations and therefore provides a broader view of the relationship between the transactive memory measure and other organizational variables. Here, the results of the cross-organizational sample will be used as a measuring stick for interpreting the case study findings.

The case study was conducted in a finance and planning department of an organization located in New York City. The organization has over 5000 employees serving in the education sector. Management was in the process of restructuring the department and updating the job descriptions to reflect the most current qualifications of its employees. The management was interested in understanding why employees across various sub-departments of the same accounting department were reluctant to share

information within and between sub-departments. There was interest in looking at organizational variables that could potentially predict transactive memory as well as organizational variables that could be predicted from our transactive memory measure.

First, the Q-TRACKS subscales of both the case study and cross-organizational samples were compared to determine whether or not there were any significant differences between similar subscales. Secondly, the complete Q-TRACKS scores for both samples were compared. Given that our cross-organizational sample included individuals from a wide variety of occupations and organizations, it was reasonable to assume that the subscales of the Q-TRACKS measure along with complete Q-TRACKS scales for the cross-organizational sample would be significantly different from our case study organization.

Hypothesis 1a: The individual Q-TRACKS subscales for the case study would be significantly different from the Q-TRACKS subscales for the cross organizational sample.

Hypothesis 1b: Overall transactive memory for the case study would be significantly different from the overall transactive memory score obtained from the cross-organizational sample.

Investigating Possible Predictors of Transactive Memory

Hypotheses were generated to investigate the specific relationship between a number of individual organizational factors and transactive memory, namely perceived organization support, interaction frequency, communication, trust in management and peers, heterogeneity, task cohesion, and job networking. Notably, the relationship between transactive memory and factors such as task cohesion, perceived organizational

support, and interaction frequency have never before been investigated by transactive memory researchers.

One factor believed to be related to transactive memory is perceived organization support. According to Eisenberger, Huntington, Hutchinson and Sowa (1986) perceived organization support refers to the beliefs developed by workers in an organization concerning the extent to which the organization values their contributions and cares about their well-being. When employees perceive that their efforts and actions are supported by their organization, they experience increased affective attachment to the organization. Additionally, employees develop the belief that they will be rewarded for putting greater effort into achieving the goals of the organization (Eisenberger et al., 1986). Therefore, it is reasonable to assume that individuals who perceive that their contributions are supported by the organization will be more likely to engage in activities that help the organization. One such activity is knowledge sharing and as such it is expected that perceived organizational support would have a positive influence on transactive memory.

Hypothesis 2a: Perceived organizational support will significantly predict transactive memory.

Another factor that is hypothesized to be related to transactive memory is that of trust. Interpersonal trust at work can be defined as the extent to which workers in a group are willing to attribute good intentions to and also have confidence in the words and actions of fellow work group members and management (Cook & Wall, 1980). Trust in this context is two dimensional in that it measures both faith in the trustworthy intentions of others and confidence in others' abilities. Moreland (1999) and Lewis (2003) contend that group members' trust of each other's knowledge store is an important component of

transactive memory. More recently, Chang (2004) found that development of transactive memory was greater when individuals were members of dense trust networks rather than sparse networks. As a result, it was expected that trust in both management and peers would be significantly related to transactive memory. However, as opposed to Moreland (1999) and Lewis (2003), trust was not hypothesized to be a significant component of transactive memory systems.

Hypothesis 2b: Trust in management and peers will significantly predict transactive memory.

A third factor hypothesized to be related to transactive memory is communication. As noted earlier, an essential component of Wegner et al. (1985) conception of transactive memory was the importance of looking at the communicative processes among group members when analyzing group behavior. The definition of transactive memory put forward by Wegner and colleagues and later by Brauner (2002) both emphasized the importance of communication processes in the development and effective functioning of transactive memory systems. It is therefore expected that communication will have a positive influence on transactive memory.

Hypothesis 2c: Communication will significantly predict transactive memory.

The frequency with which individuals in a work group interact should be significantly related to the development of a transactive memory system. Interaction frequency here refers to the various forms of work related interaction that take place between work unit members (McAllister, 1995). Frequent interaction is believed to result in more opportunities for conversations between workers and the possibility for increased knowledge sharing. Increased interaction could also affect trust, which is positively

associated with transactive memory. McAllister (1995) found that interaction frequency was positively associated with affect-based trust. By increasing the chances for knowledge sharing it is expected that interaction frequency would have a positive influence on transactive memory.

Hypothesis 2d: Interaction frequency will significantly predict transactive memory.

Expertise diversity is considered to be a positive asset for most organizations. A number of researchers (Jochmann & Sommer, 2002; Lewis, 2003; Moreland, 1999; Wegner, 1985) agree that having individuals with diverse expertise or experiences is important for the effectiveness of transactive memory systems. Having individuals with a diverse range of expertise confers an advantage in that the group has access to a greater range of knowledge than would be available if everyone had the same type of knowledge. Having diverse expertise also reduces the burden on the cognitive resources of individual group members because they do not need to know everything, rather just their chosen area of expertise. Differentiation of expertise is an important component of the Q-TRACKS measure; therefore we expected that a measure of heterogeneity would be significantly related to transactive memory. Heterogeneity refers to the wide range of abilities, experiences, and expertise that individual members bring to a group (Campion, Medsker, & Higgs, 1993). As a result, heterogeneity is expected to have a positive influence on transactive memory.

Hypothesis 2e: Heterogeneity will significantly predict transactive memory.

Group cohesion is not considered essential for the development of transactive memory systems. According to Moreland and Myaskovsky (2000), more important for

the development of transactive memory systems than cohesion is group members' knowledge about others' knowledge. The argument is that cohesion is a construct that addresses the social relationship levels of groups, and not the cognitive levels. Cohesion is seen as a measure of socio-emotional interdependence, whereas transactive memory is a measure of cognitive interdependence. In this study, task cohesion is defined as the extent to which members of a group are motivated towards accomplishing the organization's goals and objectives (Carless & DePaola, 2000; Widmeyer, Brawley, & Carron, 1985). Cohesion is not expected to have a significant relationship with transactive memory.

Hypothesis 2f: Task cohesion will not significantly predict transactive memory.

Knowledge sharing is the essence of most organizations and it is also very important for the development and functioning of transactive memory systems. The performance benefits associated with knowledge sharing have been documented in a number of studies on transactive memory systems (Lewis 2004; Moreland, 1999; Zhang, et al., 2007). The promotion of knowledge sharing measure used in this study assesses the extent to which group members are aware of the existence of a knowledge sharing network in their work group and the advantages associated with knowledge sharing (Jain, Sandu & Sidu, 2006). Given the importance of knowledge sharing in the development and functioning of transactive memory systems it is hypothesized that promotion of knowledge sharing would significantly predict transactive memory.

Hypothesis 2g: Promotion of knowledge sharing will significantly predict transactive memory.

Having a well developed job networking system is important for the facilitation of knowledge sharing in work groups. With a network in place, it is easier for individuals to know "who knows what" and the best way to gain access to the required information. Social networking refers to the tendency for team members to forge connections between individuals in their social network by either introducing disconnected individuals or facilitating new ventures between connected individuals (Obstfeld, 2005). This involves knowing what others know or do not know. In order for group members to be able to introduce disconnected individuals or facilitate new ventures between connected individuals, they must know who knows what in the organization or have metaknowledge. An analysis of social networks provides very useful information about both formal and informal relationships among people. With metaknowledge being an important dimension of transactive memory systems, we thus anticipate that social networking, which relies heavily on individual group members' metaknowledge, will be a significant predictor of transactive memory.

Hypothesis 2h: Job networking/ social networking will predict transactive memory.

As mentioned before, knowledge sharing is an essential component necessary for the effective functioning of many organizations. However, despite efforts to encourage knowledge sharing, barriers to knowledge sharing can exist at three levels namely the individual, organizational and technological levels (Reige, 2005). Barriers at the individual level stem from individuals' behaviors and perceptions of others' actions, whereas barriers at the organizational level originate from the corporate environment and working conditions (i.e. lack of knowledge sharing strategy or individuals with valuable

knowledge who are not physically present where it is needed most). Barriers existing at the technological levels stem from lack of availability of technical resources to facilitate knowledge sharing at all levels of the organization. These barriers to knowledge sharing are predicted to exert a negative influence on transactive memory systems.

Hypothesis 2i: Barriers to knowledge sharing will negatively predict transactive memory.

Investigating TM as a Predictor of Organizational Factors

The previously presented hypotheses examined the relationship between a number of different organizational variables and transactive memory. The goal was to determine the extent to which these identified organizational variables can be used to predict transactive memory. A second aspect of the assessment of the Q-TRACKS measure is to determine how well this measure of transactive memory can be used to predict organizational variables other than job performance such as job commitment and job satisfaction. As a result, a new set of hypotheses were generated to investigate the predictive nature of the transactive memory scale with regard to a diverse set of organizational behavior measures.

Improvements in employees' job performance have been linked to the effective development and efficient functioning of transactive memory systems by a number of researchers studying the positive benefits of transactive memory systems (see, Lewis 2004; Wegner, 1991; Zhang, et al., 2007). Despite the fact that the measure of job performance used here is an indirect measure, we expected to find a positive relationship between transactive memory and both peer and manager job performance ratings similar to that found in studies using direct measures of job performance.

Hypothesis 3a: Transactive memory will significantly predict both peer and manager job performance ratings.

The relationship between transactive memory and job commitment has never before been investigated, however, the benefits associated with an efficient transactive memory system make it likely that workers will be more inclined to stay with their work groups if they know where to get the information they need to complete their tasks and if the group is functioning as expected. It is therefore expected that transactive memory will be positively related to job commitment.

Hypothesis 3b: Transactive memory will significantly predict job commitment.

An efficiently functioning transactive memory system where group members are productive and achieve their goals should result in group members that are highly satisfied with their job.

Hypothesis 3c: Transactive memory will significantly predict job satisfaction.

In a well developed and highly efficient transactive memory system, individuals are less likely to experience burnout because knowledge sharing and differentiation reduces cognitive load on individuals. Burnout as it is referred to here is a state of physical (i.e. feeling tired), emotional (i.e. feeling depressed), and mental (i.e. feeling like a failure) exhaustion (Pines, 2005; Pines & Aronson, 1998). Burnout, it is hypothesized, will occur less frequently in transactive memory systems because workers have more time to focus on their area of expertise and they are not engaged in learning huge chunks of information to complete a task. Well developed transactive memory systems should experience low burnout while less developed transactive memory systems should

experience more burnout. It is therefore expected that transactive memory will have a significantly, negative relationship with burnout.

Hypothesis 3d: Transactive memory will be negatively related to burnout.

In addition to examining relationships between individual transactive memory measures, we will also investigate the impact of multiple factors on transactive memory. A third set of hypotheses address the relationship between multiple organizational behavior factors and transactive memory.

Hypothesis 4a: Perceived organizational support, trust in peers, and their interaction term will significantly predict transactive memory.

Hypothesis 4b: Perceived organizational support, trust in management, and their interaction term will significantly predict transactive memory.

Hypothesis 4c: Trust in peers, trust in management, and their interaction term will significantly predict transactive memory.

The final step to thoroughly understanding the nature and significance of transactive memory is to investigate the combined influence of additional organizational variables on both transactive memory and job satisfaction.

Hypothesis 5a: Heterogeneity, interaction frequency, communication, and promotion of knowledge sharing will significantly predict transactive memory.

Hypothesis 5b: Heterogeneity, interaction frequency, communication, promotion of knowledge sharing and transactive memory will significantly predict job satisfaction.

Hypothesis 6a: Barriers to knowledge sharing will have a negative relationship with transactive memory, whereas perceived organizational support and trust will have a positive relationship with transactive memory.

Hypothesis 6b: Barriers to knowledge sharing will have a negative relationship with job satisfaction, whereas perceived organizational support, trust, and transactive memory will positively relate to job satisfaction.

Method

Participants

Participants in Study 3 (the intra organizational study) were 40 full-time and part-time employees (13 males, 26 females, and 1 missing data on sex) recruited from a large finance and planning office in a large organization. The average age of participants in the organization was 35 years old (*SD* = 14.06), with a range from 20-76 years. With regard to education, 2 participants completed high school, 17 had some college, 8 completed college, 7 had some graduate school experience, 3 participants completed graduate school, and 3 participants did not respond. Thirty five percent of participants identified as White, 25% as Black, 10% as Asian or Pacific Islander, 10% as Hispanic, 5% as Caribbean Black, 2% as Caribbean Indian, 8% reported their ethnicity as "other", and 5% did not report ethnicity. Twenty-eight participants were full-time employees and 12 participants were employed part-time. Full-time participants on average had 8.48 years of work experience (*SD*=6.50) whereas part-time participants on average had 3.76 years of work experience (*SD*=8.29) with their current organization. The breakdown for level education was: 5% (2) completed high school, 42.5% (17) some college (not yet completed), 20% (8) college degree (e.g. B.A. or B.S.), 17.5% (7) some graduate school

(not yet completed), 7.5% (3) graduate school degree, and 7.5% (3) with missing data on education. The racial-ethnic composition of the sample was: 25% (10) of the sample identified as Black, 35% (14) identified as White, 10% (4) identified as Asian/Pacific Islander, 10% (4) identified as Hispanic/ Latino, 7.5% (3) identified as Caribbean Black/Indian, 7.5% (36) identified as other, and 5% (2) had missing data on ethnicity.

Participants for the cross-organizational sample were 402 students (155 males, 242 females, and 5 with missing data on sex) from the City University of New York. The employment status of participants was as follows: 48% (193) reported being employed full-time, 50% (200) reported being employed part-time and 2% (9) had missing data on employment status. Full-time participants on average had 4.24 years of work experience (*SD* = 5.28) while part-time participants on average had 1.50 years of work experience (*SD* = 1.60). The high rate of student participants who were employed either full-time or part-time is in part due the fact that the university is located in a major U.S. city and serves a largely middle-class community. Participants ranged in age from 18 to 65 years (*M* = 26.7, *SD* = 10.5). The breakdown for level education was: 9% (35) completed high school, 64% (256) some college (not yet completed), 16% (64) college degree (e.g. B.A. or B.S.), 1% (7) some graduate school (not yet completed), 4% (15) graduate school degree, and 6% (25) with missing data on education. The racial-ethnic composition of the sample was: 20% (81) of the sample identified as Black, 32% (130) identified as White, 10% (39) identified as Asian/Pacific Islander, 17% (68) identified as Hispanic/ Latino, 15% (61) identified as Caribbean Black/Indian, 4% (16) identified as other, and 2% (7) had missing data on ethnicity.

Measures

A total of 18 scales were used in Study 3 with each one varying in the total number of items. The score for each individual scale was averaged into a single score with the exception of the Spector (1985) job satisfaction scale and Cook and Wall (1980) trust scale where a summed index for each individual was calculated. As in Study 2, and to facilitate data analysis, the original Likert scales of all the measures were standardized as well as the scores from each scale. For all scales, employees used a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree) to indicate the extent of their agreement with each item.

Included in the questionnaire for Study 3 were a number of items and scales that were not used in the final analysis. For example, the questionnaire included one item that assessed whether the respondent reported to more than one supervisor (item 169) and two items that assessed whether the respondent felt he or she had coworkers who could serve as sources for job related information (items 170 and 171). These three items were not included because there were not enough responses from participants to conduct meaningful analyses. Also included in the survey but not considered during the analysis were the Cammann, Fischman, Jenkins, and Kelsh (1983) job commitment scale (intent to turnover) and the Van Dyne and LePine (1998) job performance (Top Down) measure. The VanDyne and LePine scale measures managers' ratings of subordinates' job performance. This measure was not used in analyses because there were not sufficient managers responding from each of the departments to provide enough data to allow for a general and informative assessment of job performance.

The Brauner and Robertson Q-TRACKS transactive memory scale was used to assess transactive memory. As before, the dimensions of the Q-TRACKS scale were:

integration, differentiation, cognitive interdependence, metaknowledge, and transactivity. A complete version of the questionnaire used in Study 3 can be found in Appendix D.

Perceived organizational support was measured using a short version of the Eisenberger, Huntington, Hutchinson, and Sowa (1986) perceived organizational support scale. Perceived organizational support refers to a set of universal beliefs that work group employees form about the extent to which their well being and contributions are valued by the organization. The scale contains 17 items all of which can be found in Table 24.

Table 24. Perceived Organizational Support Items

1. My Organization values my contribution to its well-being.
2. If my organization could hire someone to replace me at a lower salary it would do so. ®
3. My organization fails to appreciate any extra effort from me. ®
4. My organization strongly considers my goals and values.
5. My organization would ignore any complaint from me. ®
6. My organization disregards my best interests when it makes decisions that affect me. ®
7. Help is available from my organization when I have a problem.
8. My organization really cares about my well-being.
9. Even if I did the best job possible, my organization would fail to notice. ®
10. My organization is willing to help me when I need a special favor.
11. My organization cares about my general satisfaction at work.
12. If given the opportunity, my organization would take advantage of me. ®
13. My organization shows very little concern for me. ®
14. My organization cares about my opinions.
15. My organization takes pride in my accomplishments at work.
16. My organization feels that anyone could perform my job as well as I do.
17. My organization tries to make my job as interesting as possible.

Interpersonal trust at work was measured using 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 peers, faith in intentions of management, confidence in actions of peers, and confidence in actions of management. Trust in this context refers to the extent to which individual group members are willing to ascribe good intentions to and have confidence in the words and actions of fellow group members. An overall trust score was calculated by tallying the scores of all four subscales. A complete listing of all interpersonal trust items appear in Table 25.

Table 25. Interpersonal Trust Items

Faith in Intentions of Management
1. Management at my organization is sincere in its attempts to meet the workers' point of view.
2. I feel quite confident that my organization will always try to treat me fairly.
3. Our management would be quite prepared to gain advantage by deceiving the workers. ®
Confidence in Actions of Management
4. My organization has a poor future unless it can attract better managers. ®
5. Management can be trusted to make sensible decisions for my organization's future.
6. Management at work seems to do an efficient job.
Faith in Intensions of Peers
7. If I got into difficulties at work, I know my workmates would try and help me out.
8. I can trust the people I work with to lend me a hand if I needed it.
9. Most of my workmates can be relied upon to do as they say they will do.
Confidence in Actions of Peers:
10. I have full confidence in the skills of my workmates.
11. Most of my fellow workers would get on with their work even if supervisors were not around.
12. I can rely on other workers not to make my job more difficult by careless work.

Communication was measured using the O'Reilly and Roberts (1976) Communication scale that describes communication as information exchange. The communication scale is a 10 item scale that measures two sub-components of communication: openness and accuracy. Communication openness refers to the ease with which one is able to speak to fellow group members, whereas communication accuracy deals with the truthfulness of the information exchanged between group members. Table 26 presents the items for the two communication dimensions measures.

Table 26. Communication Items

Openness
1. It is easy to talk openly to all members of this work unit.
2. Communication in this work unit is very open.
3. I find it enjoyable to talk to other members of this work unit.
4. When people talk to each other in this work unit, there is a great deal of understanding.
5. It is easy to ask advice from any member of this work unit.
Accuracy
6. The information I receive is often inaccurate.
7. I can think of a number of times when I received inaccurate information from others in this work unit.
8. It is often necessary for me to go back and check the accuracy of the information I've received.
9. I sometimes feel that others don't understand the information they have received.
10. The accuracy of information passed among members of the work unit could be improved

Interaction frequency was measured using an adaptation of the McAllister (1995) interaction frequency scale. The adaptation involved changing the wording of the 4-item scale to reflect interactions between team members instead of interactions with a focal manager. Interaction frequency here refers to the frequency of various forms of work

related interactions with fellow group members. Table 27 presents the interaction frequency items.

Table 27. Interaction Frequency Items

1. Team members initiate work-related interaction with me very frequently.
2. I initiate work-related interaction with team members very frequently.
3. I interact with team members at work very frequently.
4. I interact with team members very frequently informally or socially at work.

Heterogeneity was measured using the Campion, Medsker, and Higgs (1993) heterogeneity scale. Heterogeneity refers to group members' diversity with respect to abilities and experiences. Table 28 presents the three heterogeneity items.

Table 28. Heterogeneity Items

1. The members of my team vary widely in their areas of expertise.
2. The members of my team have a variety of different backgrounds and experiences.
3. The members of my team have skills and abilities that complement each other.

Task cohesion was measured using the Carless and De Paola (2000) Cohesion measure. The original scale consists of 10 items and three subscales: task cohesion, social cohesion, and individual attraction to the group. Task cohesion subscale measures the degree to which work unit members are united and committed to achieving the group task. The items for the task cohesion measure are presented in Table 29.

Table 29. Task Cohesion Items

1. Our team is united in trying to reach its goals for performance.
2. I'm unhappy with my team's level of commitment to the task. ®
3. Our team members have conflicting aspirations for the team's performance. ®
4. This team does not give me enough opportunities to improve my personal performance. ®

Promotion of knowledge sharing was measured using an adaptation of the Jain, Sandu, and Sidu (2006) promotion of knowledge sharing measure. The two item scale assesses individuals' awareness of knowledge sharing strategies in the work unit as well as awareness of the advantages of knowledge sharing in the work unit. The items are presented in Table 30.

Table 30. Promotion of Knowledge Sharing Items

1. There is growing awareness on the benefit of knowledge sharing in my department.
2. There exists a knowledge sharing strategy in my department.

Job networking was measured using an adaptation of the Obstfeld (2005) "Tertius Iungens" orientation scale, developed to capture a group member's predisposition to bring people together in collaboration, by introducing disconnected others and forging stronger ties between individuals with existing ties between one another. The six items of the scale are presented in Table 31.

Table 31. "Tertius Iungens" Orientation or Collaboration/Social Networking Items

1. I introduce people to each other who might have a common strategic work interest.
2. I will try to describe an issue in a way that will appeal to a diverse set of interests.
3. I see opportunities for collaboration between people.
4. I point out the common ground shared by people who have different perspectives on an issue.
5. I introduce two people when I think they might benefit from becoming acquainted.
6. I forge connections between different people dealing with a particular issue.

Barriers to knowledge sharing were assessed using an adaptation of the Jain, Sandu, and Sidu (2006) measure mentioned in Study 2. The 13 item measure was adapted from a total of 15 questions designed to measure the extent to which employees are aware of the various factors that hinder knowledge sharing at the individual, group, and organizational levels. Two items from the original scale that were not applicable to our research participants were omitted. Perceived barriers to knowledge sharing items are the same as presented earlier in Table 15.

Managers' job performance and peers' job performances were measured using an adaptation of the McAllister (1995) manager and peer job performance measure (same level). Job performance refers to the reputational effectiveness of the individual being assessed. The scale consists of eight items with four items measuring the assessor's ratings of his or her peers' performance and the other four items assessor's ratings of his or her manager's job performance. For the purpose of this study, the scale was rewritten to allow individual group members to rate their fellow team members' job performance. The adaptation also involved changing the wording of all eight items to reflect a statement rather than a question format. 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" (see Table 32 for both managers and peer job performance items).

Table 32. Job Performance Items

Assessor's Ratings of Manager Performance
1. Overall, I very much feel that my supervisor is performing his/her total job the way I would like it to be performed.
2. I very much feel that my supervisor has met all of my expectations in his/her roles and responsibilities.
3. I am very satisfied with the total contribution made by my supervisor.
4. If I had my way, I would considerably change the manner in which my supervisor is doing his/her job.
Assessor's Ratings of Peers Performance
5. Overall, I very much feel that my team members are performing their total job the way I would like it to be performed.
6 I very much feel that team members have met all of my expectations in their roles and responsibilities.
7. I am very satisfied with the total contribution made by my team members.
8. If I had my way, I would you considerably change the manner in which my team members do their jobs.

Commitment to the organization was measured using the Meyer, Allen, and Smith (1993) Commitment scale. Organizational commitment refers in particular to employees' commitment to their employers, and the scale consists of 18 items that measures three dimensions of commitment: affective commitment, continuance commitment, and normative commitment. Affective commitment refers to commitment based on emotional attachment to the organization. Continuance commitment refers to commitment that arises from weighing the cost associated with leaving the organization. Normative commitment describes commitment that arises out of the sense of feeling obligated to

remain with the organization. Items for all three job commitment subscale are presented in Table 33.

Table 33. Job Commitment Items

Affective Commitment
1. I would be very happy to spend the rest of my career with my organization.
2. I really feel as if the problems of my organization are my own.
3. I do not feel a strong sense of "belonging" to my organization. ®
4. I do not feel "emotionally attached" to my organization. ®
5. I do not feel like "part of the family" at my organization. ®
6. My organization has a great deal of personal meaning to me.
Continuance Commitment
7. Right now, staying with my organization is a matter of necessity as much as desire.
8. It would be very hard for me to leave my organization right now, even if I wanted to.
9. Too much of my life would be disrupted if I decided I wanted to leave my organization now.
10. I feel that I have too few options to consider leaving my organization.
11. If I had not already put so much of myself into my organization, I might consider working elsewhere.
12. One of the few negative consequences of leaving my organization would be the scarcity of available alternatives.
Normative Commitment
13. I do not feel any obligation to remain with my current employer. ®
14. Even if it were to my advantage, I do not feel it would be right to leave my organization now.
15. I would feel guilty if I left my organization now.
16. My organization deserves my loyalty.
17. I would not leave my organization right now because I have a sense of obligation to the people in it.
18. I owe a great deal to my organization.

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. Three items from the communication subscale were adapted to measure organizational communication. Scores for this scale were calculated based on the official scoring instruction recommended by Spector (1985). Scores on each of nine facet subscales were based on four items each and range from 4 to 24. In cases of missing item for subscales, the mean score per item was calculated for the individual, and that mean was substituted for the missing items. A complete listing of job satisfaction items job are presented in Table 34.

Table 34. Job Satisfaction Items

Pay
1. I feel I am being paid a fair amount for the work I do.
2. Raises are too few and far between. ®
3. I feel unappreciated by my organization when I think about what they pay me. ®
4. I feel satisfied with my chances for salary increases.
Promotion
1. There is really too little chance for promotion on my job. ®
2. Those who do well on the job stand a fair chance of being promoted.
3. People get ahead as fast here as they do in other places.
4. I am satisfied with my chances for promotion.
Supervision
1. My supervisor is quite competent in doing his/her job.
2. My supervisor is unfair to me. ®
3. My supervisor shows too little interest in the feelings of subordinates. ®
4. I like my supervisor.
Fringe Benefits
1. I am not satisfied with the benefits I receive. ®
2. The benefits we receive are as good as most other organizations offer.
3. The benefit package we have is equitable.
4. There are benefits we do not have which we should have. ®

Table 34 (*Continued*). Job Satisfaction Items

Rewards
1. When I do a good job, I receive the recognition for it that I should receive.
2. I do not feel that the work I do is appreciated. ®
3. There are few rewards for those who work here. ®
4. I don't feel my efforts are rewarded the way they should be. ®
Operation Conditions
1. Many of our rules and procedures make doing a good job difficult. ®
2. My efforts to do a good job are seldom blocked by red tape.
3. I have too much to do at work. ®
4. I have too much paperwork. ®
Coworkers
1. I like the people I work with.
2. I find I have to work harder at my job because of the incompetence of people I work with. ®
3. I enjoy my coworkers.
4. There is too much bickering and fighting at work. ®
Nature of Work
1. I sometimes feel my job is meaningless. ®
2. I like doing the things I do at work.
3. I feel a sense of pride in doing my job.
4. My job is enjoyable.
Work Unit Communication
1. Communications seem good within my work unit.
2. The goals of my work unit are not clear to me. ®
3. I often feel that I do not know what is going on with my work unit. ®
4. Work assignments are not fully explained. ®
Organizational Communication
1. Communications seem good within my organization.
2. The goals of my organization are not clear to me.
3. I often feel that I do not know what is going on with my organization. ®

Burnout was measured using an adaptation of the Pines (2005) burnout scale from Study 2. The adaptation involved changing the wording of the items to fit the study's 6-point Likert scale. For example, "When you think about your work overall, how often do you feel the following: I've had it?" was changed to "I often feel like I've had it". Participants were instructed to answer the burnout questions with respect to their own work experience. As recommended by Pines (2005), burnout scores for individuals were calculated by averaging responses to the 10 items. A score of 0 to 2.4 indicates a very low level of burnout; a score between 2.5 and 3.4 indicates danger signs of burnout; a score between 3.5 and 4.4 indicates burnout; a score between 4.5 and 5.4 indicates a very serious problem of burnout. A score of 5.5 requires immediate professional help. For a complete listing of all burnout items refer back to Table 14 presented earlier.

Procedure

The management of the organization involved in this study was contacted to obtain permission to conduct the study. Management then contacted all employees via email and inter-office mail to inform potential participants about the study and potential participation. The researchers later contacted employees in each sub-department and carried out separate but similar information sessions regarding the study. Participation was completely voluntary and individuals could withdraw at anytime without penalty. All information submitted was kept anonymous. 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 maintain confidentiality. Participants were instructed that they had one week to complete the questionnaire and return it to the researchers. The researchers returned after one week and collected the completed questionnaires. In cases where participants were not finished completing the questionnaire they were given two more days.

Data were collected with a single survey over a period of one month. Participants were informed that their individual responses would be kept confidential. As part of the agreement with the organization both group level and organizational level feedback was promised to the organization. At the completion of data collection, feedback was provided to the organization.

Demographic information was also collected from participants. Subscales for Q-TRACKS (integration, differentiation, metaknowledge, cognitive interdependence and transactivity) were computed as in Study 1 by averaging the corresponding items for each subscale. High scores on each subscale represent high transactive memory. Negatively worded items are marked with a ® after the item number (i.e. item 194®) and are reverse scored. For reverse coded items, a score of 6 which would normally represent strongest agreement is considered to be equivalent to a score of 1 that represents strongest disagreement on a question that is worded positively. For scales where sums were calculated, a transformation was performed to standardize all scores. The survey response rate for study 3 was 50% (n=40). The procedures used to collect data for the cross organizational sample were the same as specified in Study 2.

Results

T-test Analyses

An initial set of analyses was conducted to determine whether the case study Q-TRACKS subscales were significantly different from the cross-organizational Q-TRACKS subscales. Independent samples t-tests revealed a statistically meaningful difference on the differentiation subscale only, t (440) = 2.75, p <.01. Analyses were also conducted to determine whether the overall transactive memory scores for the case study and cross-organizational samples were significantly different from each other. No significant difference was found between the two groups, t (440) = 1.60, p >.05. The means, standard deviations, t-values and p-values for all comparisons are shown in Table 35.

Table 35. Transactive Memory Means, SD and t-values for Q-TRACKS Subscales and Overall Q-TRACKS Measure

	Cross-Organizational			Case Study			Significance
Subscales	***M***	***SD***	**N**	***M***	***SD***	***n***	***t***
Integration	3.84	1.18	402	3.87	1.06	40	*0.15*
Differentiation	4.04	1.22	402	4.59	1.08	40	***2.75****
Cognitive Interdependence	3.64	1.28	402	3.85	1.38	40	*0.97*
Metaknowledge	5.14	0.84	402	5.32	0.68	40	*1.33*
Transactivity	4.52	1.07	402	4.52	1.11	40	*0.01*
Q-TRACKS	4.23	0.74	402	4.43	0.74	40	*1.60*

Note: * p <.05

Transactive Memory as Criterion: Bivariate Regression Analyses

Bivariate linear regression analyses were conducted to assess the prediction of transactive memory from a number of predictor variables. The omnibus F-test is one method for assessing the significance of the regression model with one factor predicting

the dependent variable. However, Coolidge (2006) recommends that R^2 values $\geq .10$ can also be used as an indicator that a factor is important in explaining the variance between the dependent and independent variables.

Perceived organizational support, trust in peers, trust in management, communication, interaction frequency, heterogeneity, promotion of knowledge sharing, social networking (job networking), and barriers to knowledge sharing measures were entered into separate bivariate linear equations as predictors of transactive memory for both the cross-organizational and case study samples. Analysis of the cross-organizational sample revealed that contrary to our hypothesis, cohesion was significantly related to transactive memory for the cross-organizational sample. As hypothesized, all other regression equations were significantly related to transactive memory. With regard to the case study sample, all regression equations were significantly related to transactive memory with the exception of cohesion, promotion of knowledge sharing, and job networking. The hypothesis that cohesion would not be related to transactive memory was supported, however the hypotheses predicting that both promotion of knowledge sharing and job networking would be significantly related to transactive memory were not supported (see Tables 36 and 37).

Perceived organizational support was a significant predictor of transactive memory in the case study sample ($\beta = .43$, $p < .01$) as in the cross-organizational sample ($\beta = .42$, $p < .001$) accounting for approximately 16% and 17% of the variance of transactive memory, respectively. Likewise, trust in peers was a significant predictor of transactive memory in both the case study ($\beta = .56$, $p < .001$) and the cross-organizational samples ($\beta = .47$, $p < .000$), however it accounted for a greater percentage of the variance

of transactive memory in the case study (30%) compared to cross-organizational sample (23%). Trust in peers (30%) also accounted for almost double the amount of variance of transactive memory compared to perceived organizational support 16%. Trust in management was a significant predictor of transactive memory again for both the case study (β = .31, p < .05) and cross-organizational samples (β = .31, p < .001), but unlike trust in peers, it only accounted for approximately 13% and 10% of the variance of transactive memory, respectively.

Communication was hypothesized to be a significant predictor of transactive memory and results from both the case study (β = .42, p < .01) and cross-organizational samples (β = .42, p < .001) supported the hypothesis. Communication accounted for approximately 18% of the variance of transactive memory in both samples. Similarly, interaction frequency (β = .40, p < .01) and heterogeneity (β = .44, p < .01) in the case study sample were significant predictors of transactive memory. These findings were analogous to those of the cross-organizational study in which interaction frequency (β = .38, p < .001) and heterogeneity (β = .48, p < .001) were shown to be significant predictors of transactive memory. While the percentage of transactive memory variance explained was the same for the two groups with respect to interaction frequency (14%), heterogeneity in the case study (17%) accounted for a slightly lower percentage of the variance of transactive memory compared to the cross organizational sample (23%).

As predicted, barriers to knowledge sharing for the case study (β = -.35, p < .05) as well as the cross-organizational sample (β = -.34, p < .001) had a significant but negative relationship with transactive memory and accounted for roughly 10 % of the

variance of transactive memory in both samples. This negative relationship indicates that as barriers to knowledge sharing increase, transactive memory decreases, and vice versa.

The initial hypothesis specifying no significant relationship between cohesion and transactive memory was supported in the case study (β = .15, p > .05). These findings, however, were in contrast to the significant relationship observed between cohesion and transactive memory in the cross-organizational sample (β = .20, p < .001). Cohesion for the cross-organizational sample accounted for approximately 12% of the variance of transactive memory.

An interesting finding was that promotion of knowledge sharing (β = .25, p > .05) and social networking (job networking) (β = .30, p > .05) in the case study were both not significant predictors of transactive memory, despite the findings from the cross-organizational sample, which showed that both promotion of knowledge sharing (β = .34, p < .001) and social networking (job networking) (β = .33, p < .001) were significant predictors of transactive memory accounting for 11% and 10% of the variance of transactive memory respectively.

Table 36. Case Study: Predicting Impact of Individual Organizational Factors on TM

Predictors *(n=40)*	**R**	**R^2**	**ΔR^2**	**S.E.**	***t***	***F***
Perceived Organizational Support	.43	.18	.16	.68	2.91	**8.48***
Trust in Peers	.56	.32	.30	.62	4.21	**17.70*****
Trust in Management	.36	.13	.11	.70	2.38	**5.68***
Communication	.42	.18	.16	.68	2.87	**8.22***
Interaction Frequency	.40	.16	.14	.68	2.70	**7.31***
Heterogeneity	.44	.20	.17	.67	3.04	**9.24****
Cohesion	.20	.04	.01	.73	1.24	1.53
Promotion of Knowledge Sharing	.25	.06	.04	.73	1.56	2.42
Social Networking/Job Networking	.31	.10	.07	.71	1.94	3.78
Barriers to Knowledge Sharing	.35	.13	.10	.71	-2.30	**5.29***

Note: * p <.05; ** p <.01; *** p <.001. Δ R^2= adjusted R^2. Outcome = Transactive memory

Table 37. Cross-Organizational: Predicting Impact of Individual Organizational Factors on TM

Predictors *(n=402)*	**R**	**R^2**	**ΔR^2**	**S.E.**	***t***	***F***
Perceived Organizational Support	.42	.18	.17	.67	9.11	**83.08*** **
Trust in Peers	.48	.23	.22	.65	10.67	**113.79*** **
Trust in Management	.31	.10	.10	.70	6.50	**42.19*** **
Communication	.42	.18	.17	.67	9.22	**85.02*** **
Interaction Frequency	.38	.14	.14	.68	8.19	**67.07*** **
Heterogeneity	.48	.23	.23	.65	10.89	**118.69*** **
Cohesion	.34	.12	.12	.70	7.31	**53.49*** **
Promotion of Knowledge Sharing	.34	.11	.11	.70	7.16	**51.32*** **
Social Networking/Job Networking	.33	.11	.10	.70	6.85	**46.89*** **
Barriers to Knowledge Sharing	.34	.12	11	.70	-7.20	**51.68*** **

Note: *** p <.001. Δ R^2= adjusted R^2. Criterion = Transactive memory

Transactive Memory as Criterion: Multiple Regression Analyses

Multiple regression analyses were conducted to evaluate the predictive value of a diverse sets of factors on transactive memory as would be expected in a real world setting. Given our sample size (n = 40) for the case study and the general rule of thumb (10 to 15 cases of data per predictor variable in the model) identified by Field (2005), we limited our analysis to a maximum of four predictor variables in the models for both samples in order to make the appropriate comparisons. There were a total of seven predictor variables classified into two groups based on our two a priori hypotheses regarding the influence of the measures on transactive memory. The groupings were as follows: transactive memory noncritical measures that included perceived organization support, trust in peers, and trust in management as predictors. The second analysis included transactive memory critical measures such as heterogeneity, interaction frequency, communication, and promotion of knowledge sharing. The criterion variable used in the analysis was the overall transactive memory index for Q-TRACKS.

In a multiple regression analysis in which perceived organization support, trust in peers, and their interaction term were the predictors, only trust in peers for the case study sample was significantly related to transactive memory, $\beta = .87$, t (38) = 1.82, $p < .05$. In the cross-organizational sample both trust in peers $\beta = .51$, t (384) = 3.10, $p < .01$) and perceived organizational support ($\beta = .87$, t (384) = 2.42, $p < .05$) were significantly related to transactive memory. In a second regression analysis with perceived organization support, trust in management, and their interaction as predictors, the linear equation for the case study sample was not significant, F (3, 36) = 2.95, $p = .05$, indicating that neither the factors nor their interaction term were significant predictors of transactive memory. This finding was similar to that observed for the cross-organizational sample in which the linear equation was significant, F (3, 382) = 28.23, $p > .001$, but none of the factors significantly predicted transactive memory.

Regression analyses in which trust in peers, trust in management, and their interaction term were predictors, revealed that only trust in peers was significantly related to transactive memory, $\beta = .88$, t (38) = 2.34, $p < .05$ for the case study. This finding contrasted that of the cross-organizational sample in which both trust in peers $\beta = .70$, t (388) = 4.67, $p < .001$, and trust in management $\beta = .39$, t (388) = 2.47, $p < .05$, were significantly related to transactive memory. The results of the case study ran contrary to our expectation that both trust in management and peers were significantly related to transactive memory. In addition, the interaction component of the two factors, also anticipated to be the strongest predictor of transactive memory, was not significant for either sample.

A second set of multiple regression analyses were conducted to investigate the influence of heterogeneity, interaction frequency, communication, and promotion of knowledge sharing on transactive memory. As mentioned before, these variables are all thought to be theoretically similar to the subscales that comprise the transactive memory measure and as such were expected to be significantly related to transactive memory. Although the linear equation predicting the relationship between the four organizational factors and transactive memory was significant, F (4, 34) = 3.99, $p < .01$, only heterogeneity for the case study sample was significantly related to transactive memory, $\beta = .34$, $p < .05$. This was an unexpected finding in that all predictors were expected to relate to transactive memory. As was the case in the cross-organizational sample, the linear equation predicting the relationship between the factors and transactive memory was significant, F (4, 386) = 55.14, $p < .001$, and all four factors were significantly related to transactive memory (see Tables 38 and 39).

Table 38. Case Study: Predicting Impact of Multiple Organizational Factors on TM

Predictors	B	S.E. (B)	*β*	*t*
Heterogeneity	.31	.14	**.34**	**2.16***
Interaction Frequency	.11	.13	.15	.83
Communication	.13	.15	.16	.83
Promotion of Knowledge Sharing	.08	.09	.13	.84

Note: $R^2 = .32$; $\Delta R^2 = .24$; * $p < .05$. Outcome = Transactive memory

Table 39. Cross-Organizational: Predicting Impact of Multiple Organizational Factors on TM

Predictors	B	S.E. (B)	*β*	*t*
Heterogeneity	.24	.03	**.34**	**7.56*** **
Interaction Frequency	.11	.03	**.17**	**3.83*** **
Communication	.14	.04	**.19**	**3.97*** **
Promotion of Knowledge Sharing	.06	.02	**.15**	**3.41****

Note: $R^2 = .36$; $\Delta R^2 = .36$; ** $p < .01$; *** $p < .001$. Outcome = Transactive memory

Multiple regression analyses were then conducted to observe the influence of barriers to knowledge sharing, perceived organizational support, and overall trust on transactive memory. Overall trust refers to trust in peers and management. We hypothesized that barriers to knowledge sharing would negatively predict transactive memory, whereas perceived organizational support and overall trust would significantly predict transactive memory in a positive direction. The linear equations for both the case study and the cross-organizational samples were significant, F (3, 38) = 6.40, $p < .01$ and F (3, 382) = 38.68, $p < .01$, respectively. However, only overall trust was significantly related to transactive memory, $\beta = .41$, $p < .05$, in the case study, whereas all three predictors were significantly related to transactive memory in the cross-organizational sample. In addition, the barrier to knowledge sharing measure was negatively related to transactive memory, as hypothesized (see Tables 40 and 41).

Table 40. Case Study: Predicting Impact of Multiple Organizational Factors on TM

Predictors	B	S.E. (B)	*β*	*t*
Barriers to Knowledge Sharing	-.14	.11	-.19	-1.33
Perceived Organizational Support	.13	.14	.15	.91
Overall Trust	.02	.01	**.41**	**2.48***

Note: $R^2 = .35$; $\Delta R^2 = .30$; * $p < .05$. Outcome = Transactive memory

Table 41. Cross Organizational: Predicting Impact of Multiple Organizational Factors on TM

Predictors	B	S.E. (B)	*β*	*t*
Barriers to Knowledge Sharing	-.10	.04	**-.13**	**-2.38***
Perceived Organizational Support	.12	.05	**.16**	**2.36***
Overall Trust	.02	.00	**.27**	**2.48*****

Note: $R^2 = .23$; $\Delta R^2 = .23$; * $p < .05$; *** $p < .001$. Outcome = Transactive memory

Transactive Memory as Predictor: Bivariate Regression Analyses

A second set of independent bivariate linear regressions were conducted with transactive memory as the predictor of organizational variables such as the assessor's rating of peer job performance rating, the assessor's rating of manager's job performance, job commitment, job satisfaction, and burnout. We hypothesized that transactive memory would be a significant predictor of all four dependent factors. Again the analysis was conducted comparing the case study findings to those of the cross-organizational sample findings. The hypothesis that transactive memory would significantly predict peer job performance ratings was supported for both the case study sample ($\beta = .46$, $p < .01$) and the cross-organizational sample ($\beta = .44$, $p < .001$), with transactive memory accounting for roughly 20% of the variance of peer job performance ratings in both samples. Transactive memory also significantly predicted manager job performance ratings in the case study sample ($\beta = .38$, $p < .05$) and the cross-organizational sample ($\beta = .30$, $p < .001$). However, the proportion of variance explained by transactive memory in the case study (12%) was greater than that explained in the cross-organizational sample (8%). Transactive memory was less accurate in predicting the ratings of manager job performance than it was in predicting ratings of peer job performance. In the case study, transactive memory was also shown to be a significant predictor of both job commitment ($\beta = .45$, $p < .01$) and job satisfaction ($\beta = .39$, $p < .05$) accounting for 18% of the variance of commitment and approximately 13% of the variance of job satisfaction, respectively.

Again these findings mirrored those of the cross organizational sample, which also found transactive memory to be a significant predictor of job commitment ($\beta = .34$, p

< .001) and job satisfaction (β = .38, p < .001). Transactive memory here accounted for a lower percentage of the variance of job commitment (11%) and a slightly higher percentage of the variance in job satisfaction (15%) compared to the case study. However, contrary to the hypothesis, transactive memory in the case study was not a significant predictor of burnout (β = .17, p > .05). This finding contrasted that of the cross organizational sample, where a significant negative relationship was found between transactive memory and burnout (β = -.22, p < .001). Despite the significant relationship between transactive memory and burnout in the cross organizational sample, transactive memory accounted for only 5% of the variance of burnout. When taking into account all five dependent factors, transactive memory predicted the most variance in peer job performance ratings (see Tables 42 and 43).

Table 42. Case Study: Predicting Impact of TM on Multiple Organizational Factors

Outcome variables (*n = 40)*	**R**	**R^2**	**ΔR^2**	**S.E.**	***t***	***F***
Peer Job Performance Ratings	.45	.21	.19	.64	3.15	9.92**
Manager Job Performance Ratings	.38	.14	.12	.72	2.51	6.30*
Commitment	.45	.21	.19	.62	3.14	9.86**
Job Satisfaction	.39	.15	.13	27.09	2.61	6.80*
Burnout	.17	.03	.00	1.07	-1.04	1.07

Note: * p <.05; ** p <.01. Predictor = Transactive memory

Table 43. Cross-Organizational: Predicting Impact of TM on Multiple Organizational Factors

Outcome variables (*n = 402)*	**R**	**R^2**	**ΔR^2**	**S.E.**	***t***	***F***
Peer Job Performance Ratings	.44	.20	.19	.73	9.81	96.24***
Manager Job Performance Ratings	.30	.09	.08	.96	6.16	37.90***
Commitment	.34	.11	.11	.92	7.03	49.43***
Job Satisfaction	.38	.15	.15	31.62	8.33	69.45***
Burnout	.22	.05	.05	1.15	-4.46	19.90***

Note: *** p <.001. Predictor = Transactive memory

Job Satisfaction as Criterion: Multiple Regression Analyses

Finally, regression analyses were conducted to investigate the influence of barriers to knowledge sharing, perceived organizational support, trust, and transactive memory on the variable of job satisfaction. We hypothesized that barriers to knowledge sharing, perceived organizational support, trust, and transactive memory would all significantly predict job satisfaction. As in the case of transactive memory, barriers to knowledge sharing were also expected to be negatively related to job satisfaction. The linear equations for the case study (F (4, 38) = 2.75, $p < .001$) and for the cross organizational sample (F (4, 381) = 152.49, $p < .001$) were significant, suggesting that the factors were related to job satisfaction. Interestingly, in the case study sample, transactive memory and trust were not significantly related to job satisfaction; however, barriers to knowledge sharing (β = -.42, $p < .001$) and perceived organizational support (β = .61, $p < .001$) were significantly related to job satisfaction. As expected, barriers to knowledge sharing was negatively related to job satisfaction. In comparison, the cross-organizational analyses revealed that perceived organizational support (β = .51, $p < .001$), trust (β = .24, $p < .001$), and transactive memory (β = .11, $p < .01$) were all significantly related to job satisfaction. However, barriers to knowledge sharing was not significantly related to job satisfaction for the cross-organizational sample (see Tables 44 and 45).

Table 44. Case Study: Predict Job satisfaction using TM and Multiple Organizational Factors

Predictors	B	S.E. (B)	β	t
Barriers to Knowledge Sharing	-11.97	1.16	**-.42**	**-4.60*** **
Perceived Organizational support	21.09	3.51	**.61**	**6.00*** **
Trust	.39	.28	.15	1.28
Transactive Memory	- 4.15	4.07	.11	1.02

Note: R^2 = .76; ΔR^2 = .73; *** p <.001. Outcome = Job Satisfaction

Table 45. Cross Organizational: Predict Job satisfaction using TM and Multiple Organizational Factors

Predictors	B	S.E. (B)	*β*	*t*
Barriers to Knowledge Sharing	-1.26	1.16	-.04	-1.08
Perceived Organizational support	15.27	1.44	**.51**	**6.00*** **
Trust	.57	.12	**.24**	**4.85*** **
Transactive Memory	4.54	1.47	**.11**	**3.09** **

Note: $R^2 = .62$; $\Delta R^2 = .61$; ** $p < .01$;*** $p < .001$. Outcome = Job Satisfaction

Summary

The purpose of Study 3 was to investigate further, in an applied setting, the relationship between transactive memory and a wide range of important organizational variables. It was hypothesized that the individual Q-TRACKS subscales for the case study would be significantly different from the corresponding individual Q-TRACKS subscales for the cross-organizational sample. Contrary to the hypothesis, only the differentiation subscales from the two samples were significantly different from each other. The hypothesis that the overall transactive memory for the case study organization would be significantly different from the overall transactive memory score obtained for the cross-organizational sample also was not supported. These two findings could be due to fact that participants in the cross-organization sample did not vary greatly with respect to participants' job characteristics.

As predicted, a number of important organizational variables such as perceived organization support, trust in peers, trust in management, communication, interaction frequency, heterogeneity, and barriers to knowledge sharing were all significant predictors of transactive memory across both the case study and cross-organizational samples. Trust in peers was found to be the most significant predictor of transactive memory compared to the other organizational variables. The impact on transactive

memory of trust in peers was also found to be greater in the case study sample. Overall results showed that trust in peers is a more important predictor of transactive memory than trust in management. These findings are consistent with those of Akün et al. (2007) and Chang (2004) who found that trust is related to transactive memory.

Communication, which is a vital component necessary for the development and effective functioning of transactive memory systems (Brauner, 2002; also see Wegner et al., 1985), was also a significant predictor of transactive memory even though its influence was low compared to trust in peers. It should be noted however, that communication was a greater predictor of transactive memory than trust in management. The finding that communication had a significant impact on transactive memory supports the findings of Hollingshead (1998a) who demonstrated that communication plays an important role in the way in which knowledge is learned and later recalled in transactive memory systems. The organizational variable heterogeneity was less predictive of transactive memory in the case study as compared to the cross organizational sample, which could indicate that individuals in the case study did not think that there was a great amount of diversity in expertise among fellow group members. We know from transactive memory theory that specialization or differentiation is also an important part of transactive memory systems (see Brauner, 2002; Moreland, 1999; Wegner et al., 1985).

As expected, barriers to knowledge sharing, another important factor, was significantly related to transactive memory with the relationship being in the negative direction. Therefore, as barriers to knowledge sharing increase, the development of transactive memory systems will be hampered. In the case of already existing transactive

memory systems, an increase in barriers to knowledge sharing should also negatively impact the effective and efficient functioning of transactive memory systems. As hypothesized, cohesion was not significantly related to transactive memory in the case study despite the finding in the cross-cross organizational sample that pointed to cohesion being significantly related to transactive memory. The finding that cohesion is not a significant predictor of transactive memory in the case study supports the argument by Moreland and Myaskovsky (2000) that cohesion is not important for the development and functioning of transactive memory systems.

Despite the findings from the cross organizational sample, which supported the hypothesis that promotion of knowledge sharing and social networking are significantly related to transactive memory, the hypothesis was not supported for the case study. This was surprising given the high level of interdependence required for tasks in the case study organization. Transactive memory systems would fail to develop or function effectively if there were problems with knowledge sharing. It should be noted, however, that the lack of a social networking structure may be the possible reason promotion of knowledge sharing was observed in the case study to not be related to transactive memory. It is also possible that there was no system in place in the case study organization to facilitate knowledge sharing.

The main focus of some of the earlier studies on transactive memory was the performance benefits of transactive memory systems. One of the most cited benefits of an efficiently functioning transactive memory system is that of improved job performance. In this study, our transactive memory measure was able to predict a number of never before investigated organizational variables including measures of job performance using

the assessor's rating of peer job performance and the assessor's rating of manager's job performance (indirect measures), job commitment, job satisfaction, and burnout. As in experiments using direct measures of job performance, transactive memory in this study significantly predicted peer job performance ratings for both the case study and the cross-organizational sample. Both assessors' ratings of peer job performance and assessors' ratings of manager job performance are considered to be indirect measures of job performance. Transactive memory also significantly predicted manager job performance ratings; however its predictive power was greater for the case study as compared to the cross-organizational sample. This may have resulted from the fact that our cross-organizational sample had many respondents who did not have to report to managers. Overall, transactive memory was a better predictor of peer job performance ratings than management job performance ratings.

One of the other important study goals was to investigate the positive benefits of transactive memory systems on organizational variables other than performance. Results of these assessments showed that transactive memory was a significant predictor of job commitment and job satisfaction in both samples although it was a better predictor of job commitment in the case study sample and of job satisfaction in the cross-organizational sample. With regard to burnout, transactive memory significantly predicted burnout in the cross organizational sample but not in the case study sample. It should be noted that despite the significant relationship between transactive memory and burnout shown in the cross organizational sample, transactive memory accounted for less than 6 percent of the variance of burnout. This suggests that transactive memory may in fact have a weak relationship with burnout overall. Clearly further research is required to investigate the

relationship in more detail. Overall, these findings support the claim that the benefits of transactive memory can be observed in organizational factors other than job performance.

Perceived organizational support and trust are two factors that, while are not considered extremely important for the development and functioning of transactive memory systems, are expected to have a positive relationship with transactive memory. When perceived organizational support, trust in peers and their interaction term were used to predict transactive memory, only trust in peers, significantly predicted transactive memory. This finding was contrary to the hypothesis that both factors along with their interaction term would be significantly related to transactive memory. Similarly, the findings across both samples that perceived organizational support, trust in management, and their interaction were not significantly related to transactive memory ran contrary to our expectations.

A third analysis that examined trust in peers, trust in management, and their interaction also predicted that all three factors would be related to transactive memory. Interestingly, for the case study, only trust in peers was significantly related to transactive memory. This finding partially confirmed the findings of the cross organizational sample in which both trust in peers and trust in management were significant predictors of transactive memory. Given the belief by researchers that trust is an important component of transactive memory, it was surprising to find that the interaction term for the two trust measures was not significantly related to transactive memory. Some researchers contend that trust is an important component of transactive memory systems (see Lewis, 2003; Moreland 1999). In this study, however, trust in management was not a significant predictor of transactive memory and the combined effect of both trust in peers and

management was also not significantly related to transactive memory. That only trust in peers appeared to be important in the case study (not also trust in management) lends support to the belief that while trust is related to transactive memory it is not considered to be a significant component of transactive memory system.

We hypothesized that organizational variables that were theoretically close to the individual subscales of Q-TRACKS, namely heterogeneity, interaction frequency, communication, and promotion of knowledge sharing, would be significantly related to transactive memory. Investigation of the relationship between these organizational factors and transactive memory revealed that only heterogeneity was a significant predictor of transactive memory for the case study sample. This finding did not fully support the hypothesis and also did not mirror the findings of the cross-organizational sample in which all four organizational factors were significantly related to transactive memory. All are considered important for transactive memory and the fact that they did not predict transactive memory in the case study possibly suggests that they need to be addressed within the organization. This could be due to the fact that the organization was undergoing restructuring during which job descriptions were being updated and revised.

A second set of factors considered to be less directly related to transactive memory were investigated to more accurately assess the nature of their relation to transactive memory, namely barriers to knowledge sharing, perceived organizational support, and overall trust. When barriers to knowledge sharing, perceived organizational support, and overall trust were used to predict transactive memory, only trust was found to be a significant predictor of transactive memory for the case study. This finding was again not consistent with the cross organizational results, which revealed that barriers to

knowledge sharing, perceived organizational support, and overall trust were predictors of transactive memory, with trust best explaining the variance in transactive memory.

With an understanding of the relationship between the various organizational factors and transactive memory in hand we took our analyses on step further to investigate the impact of other organizational factors, including transactive memory, on job satisfaction. A final analysis investigated the relationship between barriers to knowledge sharing, perceived organizational support, trust, and transactive memory on job satisfaction. All four factors were hypothesized to predict job satisfaction with transactive memory accounting for the greatest proportion of the variance in job satisfaction. Case study results revealed that both transactive memory and trust were not significant predictors of job satisfaction. However, perceived organizational support and barriers to knowledge sharing were significant predictors. These findings differed from those of the cross-organizational sample in which transactive memory, trust, and perceived organizational support were all significant predictors of job satisfaction.

Chapter 5: Discussion

With knowledge being the most valuable commodity in organizations today, there is a growing need for companies to be able to harness its benefits in order to remain competitive in a knowledge driven economy. With that in mind, knowledge management is increasingly becoming a vital part of many organizations "modus operandi". An approach that has become increasingly popular in terms better understanding ways to improve knowledge management is the focus on transactive memory systems in organizations. Transactive memory is the knowledge that people have about other people's knowledge and the transactive, knowledge-relevant processes that lead to the development and use of this knowledge. Effective knowledge management requires that organizations have a complete picture of the ideal knowledge sharing processes and techniques that maximize the utilization of its most valuable resource, knowledge. Studying transactive memory and transactive memory systems can provide a better understanding of the knowledge-relevant processes that lead to the development of transactive memory systems and facilitate knowledge sharing in organizations. Until recently, attempts to fashion a measure of transactive memory in organizations were problematic for several reasons. These included the use of less direct measures (i.e. recall measures) by researchers (see Moreland, 1999; Wegner, 1991) to infer the existence of transactive memory. Other issues were encountered with the measure developed by Jochmann and Sommer (2002) in that their measure was limited to use with German participants. A later attempt by Austin (2003) to develop a separate measure of transactive failed because the model lacked empirical support. As a result, there has been

a continued need in the field for a reliable and valid tool to assess transactive memory systems in organizations.

This study attempted to address this need in the field by developing such a measure. In order to assess the effectiveness of this tool it was necessary to test it on a cross-organizational sample as a means of generating norm values against which comparisons could be made. The final stage of this undertaking involved the application of the tool in a real world setting to further assess the effectiveness of the newly developed. Specifically, this tool can be used to assess the functioning of transactive memory systems in organizations.

Whereas earlier research in transactive memory was dominated by studies of the performance benefits associated with well developed transactive memory systems, a number of other questions pertaining to transactive memory's relation to other important organizational variables were unanswered. This was due, in part, to the lack of a generally standard measure of transactive memory.

The main goals of this research were three fold. The first goal was to design and develop a measure that would allow for the quantification and systematic assessment of transactive memory in organizations. The second goal was to validate the transactive memory questionnaire using a cross-organizational sample of participants and to create standard values for the measure against which comparisons could be made. The third goal involved the application of the QTRACKS measure in an applied setting in the form of a case study.

Study 1: Q-TRACKS Questionnaire Development

The Q-TRACKS measure was designed in accordance with the first goal of this research. Based on the five-factor theoretical framework of transactive memory proposed by Jochmann and Sommer (2002), 72 items initially developed in German to represent the five dimensions of transactive memory were first translated into English. Reliability analyses were conducted to eliminate problematic items from each subscale. A confirmatory factor analysis was then performed in order to test the hypothesis that a five factor model best represents the data. The results of the confirmatory factor analysis, using a varimax rotation, provided clear support for the a priori hypothesis that the transactive memory items of the Q-TRACKS did in fact represent manifestations of the five dimensions of the construct transactive memory. The transactive memory questionnaire (Q-TRACKS) was designed with five factors, including integration, differentiation, cognitive interdependence, metaknowledge, and transactivity all of which accounted for slightly less than 50% of the variance and were each represented by 4 items. The use of data screening techniques to eliminate badly worded items or to re-categorize items allowed for more decisive interpretations to be made about the results of the factor analysis. The remaining items all loaded onto the dimensions that they were hypothesized to represent. These findings strongly support the proposed five-factor model of transactive memory and are also consistent with the theoretical five-factor model presented in Jochmann and Sommer (2002).

The value of the Q-TRACKS lies in its ability to assess the major underlying components of effectively and ineffectively functioning transactive memory systems. These include the ability to identify group members' diverse expertise, their knowledge

about the expertise held by others, their basic level of shared knowledge about a task, their use of knowledge about others' expertise to aid in completion of a task, and their ability to connect the knowledge held by themselves and fellow group members to the overall group task. The Q-TRACKS can serve as an effective tool for organizations interested in predicting and assessing knowledge management in both work groups and the organization as whole. The measure, when used as a diagnostic tool in inefficient work groups or organizations, can identify individuals or groups who use problematic knowledge sharing processes or techniques. Once the problems have been identified, steps can be taken to resolve these issues so that groups make the most of the knowledge held by their fellow group members with regard to the group task. Another major benefit of the Q-TRACKS questionnaire is that the items are not task specific. Therefore, the scale can be used as an assessment tool across a diverse range of organizational and task settings. The length of the questionnaire (20 items) also ensures quick and efficient administration. The length of the survey could also increase the rate of participant responses.

Possible limitations to this study include the fact that there were a greater number of part-time workers in our sample compared to full-time employees. Differences may exist in individuals' perceptions of group dynamics in their organization if they are employed full-time as opposed to part-time. The fact that most of our participants were students who were also employed could impact the generalizability of the scale. It is possible that those who work and are also students choose jobs that have very similar characteristics in terms of facilitating the dual lifestyle.

The development of the survey was the first step in creating an internally reliable measure of transactive memory. This scale will provide a much needed assessment tool for transactive memory systems in organizations.

Study 2: Cross-organizational Assessment

In order to assess the Q-TRACKS, this measure was administered to participants employed either full-time or part-time and who encompassed a diverse range of jobs. Analysis of the cross-organizational data resulted in the generation of standard means for each of the Q-TRACKS subscales along with an overall Q-TRACKS transactive memory mean value for the complete scale. The values for each scale were calculated from participant responses to items on a 6-point likert scale (1= strongly disagree to 6=strongly agree).

Convergent validity analysis for the complete scale as well as individual subscales was undertaken. Comparison of the Q-TRACKS with the Lewis (2003) transactive memory measure revealed that the two scales had a highly significant positive correlation. Convergent validity tests suggested that the Q-TRACKS subscales also behaved as expected when related to similar constructs. A moderately weak positive correlation was found between the integration subscale and the coordination subscale, however the relationship was significant. The weak relationship observed here is in part due to the fact that the two constructs are not considered to be highly similar. Coordination was used because it was the best alternative given that no other scales similar to integration are in use. A similar result was found for the correlation between the metaknowledge subscale and the promotion of knowledge sharing subscale. Again the issue here is that the promotion of knowledge sharing measure was the best alternative to

be used in the analysis given a similar measure in the field. Therefore, we contend that the weak relationship could in part be due to differences between the two measures. A significant but moderate positive correlation was found between the differentiation subscale and the specialization subscale. Similar results were obtained for the correlation between the cognitive interdependence subscale and the interdependence measure as well as the transactivity and communication subscales. Despite the weak albeit significant positive evidence found in support of the convergent validity of two of the five Q-TRACKS subscales, the findings can be taken as support for convergent validity of the overall scale and its subscales.

Assessment of the discriminant validity of the overall Q-TRACKS scale and its subscales was also conducted to ensure that the scales were theoretically distinct from known, unrelated constructs. Initial discriminant analyses conducted using the correlational method provided unclear results, and thus a second technique for assessing discriminant validity was used. Discriminant validity tests suggested that the Q-TRACKS measure as well as its subscales behaved as expected by demonstrating distinctiveness from constructs they were not designed to measure. Confirmatory factor analyses using a varimax rotation revealed that the integration and specialization subscales were distinct constructs. A second confirmatory factor analysis also revealed that differentiation and coordination were separate constructs. Similarly, factor analyses revealed that the metaknowledge subscale was distinct from the job ambiguity measure. A fourth factor analysis conducted with items from the cognitive interdependence subscale and the interdependence scale revealed that items from the two scales measured separate constructs. With regard to the factor analysis conducted using the transactivity items and

items from the burnout measure, results supported the hypothesis that the items represented distinct constructs. Finally, factor analysis using the items from the complete Q-TRACKS scale and the barriers to knowledge sharing measure demonstrated that items for the two scales measured distinct constructs.

One potential issue with this study is the fact that the sample size (n=402) used to generate the scale standards may not have been adequate. A larger sample would be required to generate a more general set of scale standards. Another potential problem is that a more thorough in depth analysis of the scale's ability to demonstrate convergent, discriminant, and criterion validity is still needed across both large samples of organizations and task characteristics. While convergent and discriminant validity were assessed here, criterion validity was not directly assessed and warrants attention. The lack of test-retest reliability assessment also poses a problem for interpretation of the results. This was in part due to both time and financial constraints on the projects. Future studies will assess the reliability of Q-TRACKS and its subscales.

Taken together, the findings of both the convergent and discriminant analyses provide some support for the validity of the Q-TRACKS measure as well as its subscales. The norms generated can serve as the measuring stick against which other samples can be compared. The norm method was the most feasible for assess the effectiveness of other transactive memory systems due to time constraints. As the scale is used in other studies, more reliable and valid standards will be created. Until such time, the results should be interpreted with caution.

Study 3: Case Study Assessment

The third goal of this research was accomplished by conducting an additional study in which the Q-TRACKS measure was used in an applied setting in order to investigate its relationship to other organization variables. Case study results were evaluated by comparing them to the findings from a cross organizational sample that served as the standard. Comparisons of the individual Q-TRACKS subscales across the two samples revealed that only differentiation differed significantly. With regard to overall transactive memory across the two samples, no significant differences were obtained contrary to the predictions. These two findings could be due to fact that participants in the cross-organizational sample did not vary greatly with respect to participants' job characteristics.

Additional analyses exploring the impact of important organizational variables such as perceived organizational support, trust in peers, trust in management, communication, interaction frequency, heterogeneity, and barriers to knowledge sharing were all found to be significant predictors of transactive memory for both the case study and cross-organizational samples. Interestingly, trust in peers was the most important predictor of transactive memory compared other important organizational variables such as interaction frequency, communication, and heterogeneity for both samples.

Contrary to Moreland and Myaskovsky's (2000) contention that cohesion is not important for the development and functioning of transactive memory systems, results from the cross-cross organizational sample identified cohesion as being significantly related to transactive memory. Surprisingly, promotion of knowledge sharing and social networking were not significantly related to transactive memory in the case study.

Knowledge sharing and social networking can be viewed as important for the functioning of transactive memory systems. Additional analyses support the already known performance benefits of transactive memory systems. Transactive memory in this study was found to predict peer job performance ratings for both the case study and the cross-organizational sample.

Further investigation of the positive benefits of transactive memory systems reveals that it is a significant predictor of job commitment and job satisfaction in both samples although it was a better predictor of job commitment in the case study sample and job satisfaction in the cross-organizational sample.

Until recently, knowledge about the benefits of transactive memory systems was limited to performance. It is clear that these results are only preliminary and further research is required to further understand the relationship between transactive memory and a number of important organizational factors discussed here. The positive link between transactive memory and organizational factors such as job commitment and job satisfaction is encouraging and warrants further exploration.

A limitation of the study is that the data were based on self-report measures, which may be subject to bias. This bias could be reduced in future studies by collecting peer reports regarding individuals' knowledge stores, in addition to the self reports which can be used as a verification tool. Direct observation of employees in the work environment, albeit time consuming a costly undertaking, could also be used to make assessments about transactive knowledge systems. Another issue that warrants attention is the fact that the regression models used in Study 3 should be further supported before definitive conclusions can be drawn about the true relationship between some of our

predictor variables and outcome variables. We would need to replicate this study in similar environments and observe whether the relationships remain consistent.

Our study was also limited by a small sample size across the samples, which made it difficult to conduct a hierarchical analysis that would have provided valuable insight into the workings of the transactive memory systems of the sub-departments and possibly compare them to the organization as a whole. Similarly, due to the small sample size in the case study, the use of the data splitting technique to further assess the reliability of the regression model was not possible. The use of the cross-organizational sample as a comparison group might be problematic given the occupational titles of the participants, which may not have been broad enough to represent an accurate standard against which a comparison could be made.

Despite some of the problems, the study was important in providing valuable insight into the relationship between transactive memory and important organizational variables. The study also provides insight into these factors that influence transactive memory systems. A better understanding of the factors and how they influence and are influenced by transactive memory can be valuable in managing knowledge in organizations.

General Discussion

Knowledge is the most important resource of any organization and this requires that organizations have in place the proper knowledge management strategies to harness the full potential of their employees. The existence of transactive knowledge systems in work groups and organizations can provide the venue for assessing who knows what in the organization and the best ways to coordinate knowledge sharing. The ability to assess

the effectiveness of transactive knowledge systems in organizations, as will be made possible by Q-TRACKS, will enable organizations to function more effectively and operate efficiently in a knowledge economy. This Q-TRACKS scale is well suited for the applied setting because the items are not task specific and can be applied to almost any job situation using work groups. The scale also lends itself to modification to examine transactive memory within task specific jobs. As such, future studies should investigate task specific transactive memory. Akün et al. (2007) found that task complexity influenced the impact of transactive memory on project outcomes such as team learning, speed-to-market, and new product success. That is to say, even more accurate predictions can be made if researchers consider the tasks that individuals are asked to perform. Some tasks require more transactive memory than others.

Studies should be conducted with larger samples comparing transactive memory data from industries in the same field as opposed to comparisons using cross-organizational data. In addition, mediation analyses should be carried out to further investigate the role of transactive memory as a mediator in influencing the impact on other variables such as job satisfaction and job commitment. Zhang et al. (2007) found that transactive memory was a mediator of the link between team characteristics and job performance.

The research discussed here provides a starting point for taking transactive memory research in a new direction. The availability of a valid measure of transactive memory in work groups and organizations brings the potential for a better understanding of knowledge sharing in organizations and the impact it can have on individuals within these organizations. With the valuable information gained from the implementation and

use of such transactive memory measures as the Q-TRACKS, companies will be able remain competitive in a knowledge economy by maximizing their employees full knowledge sharing potential to the benefit of both the individual and the organization as a whole.

Appendix

Appendix A

Item Pool Used in Reliability Analysis (73 items)

Integration Item Pool

1. I know a lot about the other group members' responsibilities.

2. All group members have the same level of basic knowledge relevant to our work.

3. It is important for the work that all group members have the same level of knowledge on relevant subject areas.

4. Our group has an agreement regarding the use of the most important technical terms.

5. Group members have very similar knowledge relating to our work.

6. All group members bring the same amount of knowledge into the discussion of the group's tasks.

Differentiation Item Pool

7. With regard to our work, all members have their own special area of expertise.

8. Our group has been put together so that we can complement each other's specific knowledge.

9. Group members bring a wide spectrum of knowledge from different fields to our group.

10. It would be really costly to have to learn another's area of work (e.g. when filling in for someone).

11. Our individual areas of work are clearly separated.

12. We complement each other's specialized knowledge.

13. I do not need to have the specialized knowledge of the others to do my job.

14. New tasks that crop up are given to the members according to their expertise.

Appendix A continued

Cognitive Interdependence Item Pool

15. I know that my expert knowledge is needed by the group.

16. I gain a lot of additional knowledge about my area of work from other group members.

17. Work is made more difficult when a member is absent.

18. Group members can learn from each other at work.

19. The group falls much behind in its work when a member is changed.

20. A successful result can only be achieved by combining our specialized knowledge.

21. The knowledge of every member is needed in order to work on the task.

22. I would find it difficult to do my tasks without the suggestions of other group members.

23. I make an important contribution to the group with my specialized knowledge

24. It is not important that I know what the others do in their jobs.

25. Other's knowledge helps me do my task.

26. All of us benefit from the expert knowledge that individual members have.

27. Without the knowledge of the other group members, I wouldn't be able to work as effectively.

Metaknowledge Item Pool

28. My colleague always knows right away what I mean.

29. I know exactly who is responsible for any given area of work.

30. I know exactly what belongs to my area of work.

31. The group members know exactly which tasks they have to complete.

Appendix A continued

32. It is clear to whom particular information should be forwarded.

33. I usually know to whom to turn when problems occur.

34. When I think that a particular member can answer my question, I am usually right.

35. Even when I was absolutely sure that a particular member could help me with a problem, I was often wrong in the past.

36. The knowledge of an individual is often overestimated within the group.

37. I know very well who in the group can help me with a particular problem.

38. I am repeatedly surprised about the knowledge that the others have.

39. When I believe that a particular member cannot cope with a particular problem, I am usually right.

40. I know exactly which tasks the others are currently working on.

41. I am well aware of each member's particular abilities and skills.

42. If I don't know something, I know whom to ask.

43. I know who in our group has which specialized knowledge.

44. There are questions for which I don't know which one of my colleagues can help me.

45. We all know what belongs to each other's area of work.

46. Everyone is aware of the distribution of tasks.

Transactivity Item Pool

47. It is important for us that the most important technical terms are used consistently.

48. I often have the feeling that my colleagues and I are not on the same page.

49. Communication problems often occur due to differences in the use of specific terms.

50. Communication is often difficult due to the extreme specialization of the members.

Appendix A continued

51. A task is often not completed because it is not clear who is responsible for it.

52. Members exchange knowledge relevant to their work.

53. While working together, I learn what task-relevant knowledge the others have.

54. New members are informed about the different work areas of all the other members.

55. Knowledge is regularly exchanged between the group members.

56. We often talk with each other about newly gained knowledge (e.g. training, specialized Readings).

57. We frequently talk to each other about how the work is going.

58. Sometimes important information is not passed onto the appropriate member.

59 The information flows well between members.

60. When I am not sure about something, I ask the appropriate member.

61. I immediately pass on tasks that don't come under my field of expertise to the appropriate member.

62. Relevant information is passed onto the appropriate member.

63. I immediately take questions that are not within my field of expertise to the appropriate colleague.

64. I prefer to ask a member I like rather than the member who is responsible for something.

65. When questions arise, I go and ask the appropriate members.

66. My colleagues come to me with questions concerning my area of expertise.

67. If I need some information, I first ask members of the group.

68. It is a sign of incompetence to ask colleagues for advice.

Appendix A continued

69. Before asking another member, I prefer to try to find something out myself.

70. Expert knowledge is sometimes left unused even when it is relevant.

71. Even when all those consulted are not 100% sure of an answer, the group members often find a solution by working collaboratively.

72. The group often develops new ideas.

73. Often the same things are discussed over and over again without anything being gained.

Appendix B

Sample of Survey used in the Scale Development Phase

Working in Groups and Organizations

Q-TRACKS

Department of Psychology

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Dr. Elisabeth Brauner

Christine Baker McGrath, M.A.

Rommel Robertson, M.A.

Tatyana Ruzhinskaya

Lori Hoggard

Dear Participant,

Thank you very much for taking the time to answer this questionnaire! The aim of this study is to find out how information and knowledge are exchanged in groups and how this affects cooperation. It is therefore important that you ***think of one specific work group when you fill out this questionnaire***. Please answer ***all*** the questions ***with regard to this one group only***.

Furthermore, it is very important for our analyses of the research that you answer all the questions. Please check the answer that best fits your group as spontaneously as possible! If a statement does not seem to be relevant to your group then check the question mark. If you have a question about one of the statements please make a note of this in the margin or on the back of the page!

All data are confidential and anonymous, and will be used solely for scientific purposes. If you have any further questions, please do not hesitate to ask, or to contact:

Christine Baker McGrath, M.A.:	by email christinebaker@earthlink.net or by phone 718-951-4170
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Many Thanks for Your Participation and for Supporting Our Project!

Please answer the following questions about your work/work group.

1. Are you:

_____ Employed Full Time (40 hours per week)

_____ Employed Part Time (20 hours per week)

_____ A Freelancer

_____ None of the above

2. What is your occupation/title (other than student)? _____

3. What are your job duties? _____

_____

4. Do you work with other individuals? ___ Yes ___ No (Please only check one.)

5. What do you work on with other individuals? _____

_____

---

6. Your Occupation: _____

7. Type of Group:
Please start here by providing a brief description, in a couple of sentences, of what kind of work your group is doing, and which tasks it is performing.

Information About Your Work Group

*Please answer the following questions **with regard to your work group**!*

*Please always think about the **one and the same** group!*

If this is not applicable to your group, please check the question mark.

8. How many members does your group have? ……

9. How many years and months has your group been in existence? ……

10. How long is the group expected to continue? .....

11. In which field is your group located?

Service sector❍ Social services sector ❍

Industry, business, and construction❍ Recreational sector ❍

Public service and administration ❍ other: ……❍

Education ❍

	YES	NO	
12. The group has a group leader.	❍	❍	?
13. There is an established hierarchy in the group.	❍	❍	?

Working Together in the Groups

Please estimate how well the following statements fit your group using

a scale from 1 ="strongly disagree" to 5 = "strongly agree".

*Please mark only **one** answer for each statement!*

As above, please think about the same group!

If a statement is not relevant for your group then please check the question mark.

	strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree	
	1	2	3	4	5	6	
14. I know a lot about the other group members' tasks.	❍	❍	❍	❍	❍	❍	?
15. All group members have the same level of basic knowledge relevant to our work.	❍	❍	❍	❍	❍	❍	?
16. It is important for the work that all group members have the same level of knowledge relevant to the work.	❍	❍	❍	❍	❍	❍	?
17. With regard to our work, all members have their own special area of expertise.	❍	❍	❍	❍	❍	❍	?
18. Our group has been put together so that we can complement each other's specific knowledge.	❍	❍	❍	❍	❍	❍	?
19. Group members bring into the group a wide spectrum of knowledge from different fields.	❍	❍	❍	❍	❍	❍	?
20. There is an agreement regarding the use of the most important technical terms.	❍	❍	❍	❍	❍	❍	?
21. It would be really costly to have to learn another's area of work (e.g. when filling in for someone).	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
22. Group members have very similar knowledge relating to our work.	❍	❍	❍	❍	❍	❍	?
23. Our individual areas of work are clearly separated.	❍	❍	❍	❍	❍	❍	?
24. We complement each other's specialized knowledge.	❍	❍	❍	❍	❍	❍	?
25. It is important for us that the most important technical terms are used consistently.	❍	❍	❍	❍	❍	❍	?
26. My colleague always knows right away what I mean.	❍	❍	❍	❍	❍	❍	?
27. I often have the feeling that my colleagues and I are not on the same page.	❍	❍	❍	❍	❍	❍	?
28. Communication problems often occur due to differences in the use of specific terms.	❍	❍	❍	❍	❍	❍	?
30. Communication is often difficult due to the extreme specialization of the members.	❍	❍	❍	❍	❍	❍	?
31. I know that my expert knowledge is needed by the group.	❍	❍	❍	❍	❍	❍	?
32. I gain a lot of additional knowledge about my area of work from other group members.	❍	❍	❍	❍	❍	❍	?
33. Work is made more difficult when a member is absent.	❍	❍	❍	❍	❍	❍	?
34. Group members can learn from each other at work.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
35. The group falls behind in its work when a member is changed.	❍	❍	❍	❍	❍	❍	?
36. I do not need to have the specialized knowledge of the other's to do my job.	❍	❍	❍	❍	❍	❍	?
37. A successful result can only be achieved by combining our specialized knowledge.	❍	❍	❍	❍	❍	❍	?
38. The knowledge of every member is needed in order to work on the task.	❍	❍	❍	❍	❍	❍	?
39. I know exactly who is responsible for a certain area of work.	❍	❍	❍	❍	❍	❍	?
40. I would find it difficult to do my tasks without the suggestions of other group members.	❍	❍	❍	❍	❍	❍	?
41. I make an important contribution to the group with my specialized knowledge.	❍	❍	❍	❍	❍	❍	?
42. I know exactly what belongs to my area of work.	❍	❍	❍	❍	❍	❍	?
43. The group members know exactly which tasks they have to complete.	❍	❍	❍	❍	❍	❍	?
44. It is clear to whom particular information should be forwarded.	❍	❍	❍	❍	❍	❍	?
45. I usually know to whom to turn when problems occur.	❍	❍	❍	❍	❍	❍	?
46. When I think that a particular member can answer my question, I am usually right.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
47. Even when I was absolutely sure that a particular member could help me with a problem, I was often wrong.	❍	❍	❍	❍	❍	❍	?
48. The knowledge of an individual is often overestimated within the group.	❍	❍	❍	❍	❍	❍	?
49. I know very well who in the group can help me with a particular question.	❍	❍	❍	❍	❍	❍	?
50. I am repeatedly surprised about the knowledge that the others have.	❍	❍	❍	❍	❍	❍	?
51. When I believe that a particular member cannot cope with a particular problem, I am usually right.	❍	❍	❍	❍	❍	❍	?
52. I know exactly which tasks the others are currently working on.	❍	❍	❍	❍	❍	❍	?
53. I am well aware of each member's particular abilities and skills.	❍	❍	❍	❍	❍	❍	?
54. If I don't know something, I know whom to ask.	❍	❍	❍	❍	❍	❍	?
55. I know who has which specialized knowledge.	❍	❍	❍	❍	❍	❍	?
56. There are questions for which I don't know which of my colleagues can help me.	❍	❍	❍	❍	❍	❍	?
57. A task is often not completed because it is not clear who is responsible for it.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
58. We all know what belongs to each other's area of work.	❍	❍	❍	❍	❍	❍	?
59. Everyone is aware of the distribution of tasks.	❍	❍	❍	❍	❍	❍	?
60. Members exchange knowledge relevant to their work.	❍	❍	❍	❍	❍	❍	?
61. While working together, I learn what task-relevant knowledge the others have.	❍	❍	❍	❍	❍	❍	?
62. New members are informed about the different work areas of all the other members.	❍	❍	❍	❍	❍	❍	?
63. Knowledge is regularly exchanged between the group members.	❍	❍	❍	❍	❍	❍	?
64. We often talk with each other about newly-gained knowledge (e.g. training, specialist literature).	❍	❍	❍	❍	❍	❍	?
65. All group members bring the same amount of knowledge into the discussion of the group's tasks.	❍	❍	❍	❍	❍	❍	?
66. It is not important that I know what the others do in their jobs.	❍	❍	❍	❍	❍	❍	?
67 We frequently talk to each other about how the work is going.	❍	❍	❍	❍	❍	❍	?
68. Sometimes important information is not passed onto the appropriate member.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
69. The information flows well between members.	❍	❍	❍	❍	❍	❍	?
70. New tasks that crop up are given to the members according to their expertise.	❍	❍	❍	❍	❍	❍	?
71. When I'm not sure about something I ask the responsible member.	❍	❍	❍	❍	❍	❍	?
72. I immediately pass on tasks that don't come under my field of expertise to the appropriate member.	❍	❍	❍	❍	❍	❍	?
73. Relevant information is passed onto the appropriate member.	❍	❍	❍	❍	❍	❍	?
74. I immediately give questions that don't come under my field of expertise to the appropriate colleague.	❍	❍	❍	❍	❍	❍	?
75. I prefer to ask a member I like rather than the member who is responsible for something.	❍	❍	❍	❍	❍	❍	?
77. When questions arise, I go and ask the appropriate members.	❍	❍	❍	❍	❍	❍	?
78. My colleagues come to me with questions concerning my area of expertise.	❍	❍	❍	❍	❍	❍	?
79. If I need some information, I first ask members of the group.	❍	❍	❍	❍	❍	❍	?
80. It is a sign of incompetence to a ask colleague for advice.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
81. Before asking another member, I prefer to try to find something out myself.	❍	❍	❍	❍	❍	❍	?
82. Expert knowledge is sometimes left unused even when it is relevant.	❍	❍	❍	❍	❍	❍	?
83. Other's knowledge helps me do my task.	❍	❍	❍	❍	❍	❍	?
84. Even when all those consulted are not 100% sure of an answer, the group members often find a solution by working collaboratively.	❍	❍	❍	❍	❍	❍	?
85. The group often develops new ideas.	❍	❍	❍	❍	❍	❍	?
86. All of us benefit from the expert knowledge that individual members have.	❍	❍	❍	❍	❍	❍	?
87. Often the same things are discussed over and over again without anything being gained.	❍	❍	❍	❍	❍	❍	?
88. Without the knowledge of the other group members, I wouldn't be able to work as effectively.	❍	❍	❍	❍	❍	❍	?
89. I can rely on the other group members.	❍	❍	❍	❍	❍	❍	?
90. The members feel committed to each other.	❍	❍	❍	❍	❍	❍	?
91. I have the feeling that it's up to me to do most of the work in the group.	❍	❍	❍	❍	❍	❍	?
92. I identify with the group.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
93. When I have questions or problems, I can turn to other members with confidence.	❍	❍	❍	❍	❍	❍	?
94. There is no sense of community amongst the members.	❍	❍	❍	❍	❍	❍	?
95. There is a lack of trust among us.	❍	❍	❍	❍	❍	❍	?
96. Even though we work together as a group, I have the feeling I do the work on my own.	❍	❍	❍	❍	❍	❍	?
97. I am willing to give information about my area of work to the other group members.	❍	❍	❍	❍	❍	❍	?
98. I feel very close to the members of the group.	❍	❍	❍	❍	❍	❍	?
99. The other group members would turn to me with confidence if they had any questions.	❍	❍	❍	❍	❍	❍	?
100. There is a strong sense of belonging in the group.	❍	❍	❍	❍	❍	❍	?
101. I have trust in the ability of the other members.	❍	❍	❍	❍	❍	❍	?
102. I am aware of my responsibility as a representative for my area of work.	❍	❍	❍	❍	❍	❍	?
103. I do not fit in well with the other members of my group.	❍	❍	❍	❍	❍	❍	?
104. The other group members perform at their best.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
105. I prefer to deal with work related problems alone rather than with the group.	❍	❍	❍	❍	❍	❍	?
106. We all treat one another with mutual confidence.	❍	❍	❍	❍	❍	❍	?
107. Some members shirk their responsibilities.	❍	❍	❍	❍	❍	❍	?
108. I have trust in the other group members' knowledge.	❍	❍	❍	❍	❍	❍	?
109. Suggestions from individual members are received openly by the group.	❍	❍	❍	❍	❍	❍	?
110. We have a shared group goal.	❍	❍	❍	❍	❍	❍	?
111. Each of us gives his or her best.	❍	❍	❍	❍	❍	❍	?
112. Some in the group let others do their work for them.	❍	❍	❍	❍	❍	❍	?
113. We all pull together.	❍	❍	❍	❍	❍	❍	?
114. I feel I am a valued member of the group.	❍	❍	❍	❍	❍	❍	?
115. I cannot rely on some of the group members.	❍	❍	❍	❍	❍	❍	?
116. Some members exploit the hard work of others.	❍	❍	❍	❍	❍	❍	?
117. It is very important for me to belong to this group.	❍	❍	❍	❍	❍	❍	?
118. We stick together in crisis situations.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
119. All group members take part equally in the group discussions.	❍	❍	❍	❍	❍	❍	?
120. I see myself as an important part of the group.	❍	❍	❍	❍	❍	❍	?
121. The group cohesion is weak.	❍	❍	❍	❍	❍	❍	?
122. A task is often not done because no one feels responsible.	❍	❍	❍	❍	❍	❍	?
123. The assignment of tasks to group members is done collectively.	❍	❍	❍	❍	❍	❍	?
124. Our group often meets to coordinate tasks.	❍	❍	❍	❍	❍	❍	?
125. Responsibilities are assigned through collaborative discussion.	❍	❍	❍	❍	❍	❍	?
126. The members work together on a group task.	❍	❍	❍	❍	❍	❍	?
127. All the individual contributions serve the group goal.	❍	❍	❍	❍	❍	❍	?
128. Everyone in our group has their own special area of work.	❍	❍	❍	❍	❍	❍	?
129. The group members know what part they play in the whole group task.	❍	❍	❍	❍	❍	❍	?
130. The members' tasks are all of equal value.	❍	❍	❍	❍	❍	❍	?
131. Everyone makes his or her personal contribution to the end result.	❍	❍	❍	❍	❍	❍	?

	strongly disagree 1	moderately disagree 2	slightly disagree 3	slightly agree 4	moderately agree 5	strongly agree 6	
132. The members work together chaotically.	❍	❍	❍	❍	❍	❍	?
133. Misunderstandings are common.	❍	❍	❍	❍	❍	❍	?
134. There are often coordination problems between the members.	❍	❍	❍	❍	❍	❍	?
135. A task often goes undone because members believe that someone else knows, or will do it.	❍	❍	❍	❍	❍	❍	?
136. Unexpected problems can be solved quickly.	❍	❍	❍	❍	❍	❍	?
137. The quality of our final product meets the desired standard.	❍	❍	❍	❍	❍	❍	?
138. The ability of the group to work together has improved with time.	❍	❍	❍	❍	❍	❍	?
139. The group completes its task within the scheduled time frame.	❍	❍	❍	❍	❍	❍	?
140. While working together, the performance of the group has improved.	❍	❍	❍	❍	❍	❍	?
141. The experiences in the group have contributed to the personal development of the members.	❍	❍	❍	❍	❍	❍	?

About You

Age: …… Years

Sex: female ❍ male ❍

Level of education:

High school ❍

College ❍

Graduate School ❍

Many Thanks for Your Support!

Appendix C

Q-TRACKS: Final 5 Factor Solution after Confirmatory Factor Analysis

Integration

1. All group members have the same level of basic knowledge relevant to our work.

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

3. The group members have relatively similar knowledge relating to our work.

4. All group members bring the same amount of knowledge into the discussion of the group's tasks.

Differentiation

1. With regard to our work, all members have their own special area of expertise.

2. Our group has been put together so that we can complement each other's specific knowledge.

3. Group members bring a wide spectrum of knowledge from different fields to our group.

4. We complement each other's specialized knowledge.

Cognitive Interdependence

1. A successful result can only be achieved by combining our specialized knowledge.

2. The knowledge of every member is needed in order to work on the task.

3. I would find it difficult to do my tasks without the suggestions of other group members.

4. Without the knowledge of the other group members, I wouldn't be able to work as effectively.

Appendix C continued

Metaknowledge

1. I usually know to whom to turn when problems occur.

2. When I think that a particular member can answer my question, I am usually right.

3. I know very well who in the group can help me with a particular problem.

4. If I don't know something, I know whom to ask.

Transactivity

1. Members exchange knowledge relevant to their work.

2. Knowledge is regularly exchanged between the group members.

3. We often talk with each other about newly gained knowledge (e.g. training, specialized Readings).

4. We frequently talk to each other about how the work is going.

Appendix D

Complete Questionnaire used in Study 3

ID _____

Groups Working in Organizations

© 2007

The Graduate Center and
Brooklyn College
The City University of New York
2900 Bedford Avenue
Brooklyn, NY 11210

Elisabeth Brauner, Ph.D.
Rommel Robertson, M.A.

You must be at least 18 years old to participate in this study

This study is approved by the Committee on the Rights and Welfare of Human Subjects (IRB) at Brooklyn College, CUNY (#07-014)

Please answer the following questions about your work/work group

1. Are you:
   - ❍ Employed full-time (40 hours per week)
   - ❍ Employed part-time (20 hours or less per week)

2. What is your occupation or job title? _____

3. What are your job duties and responsibilities?

4. Which aspects of your work involve other people?

About your work unit: Please answer the following questions with regard to your work group. Please always think about the one and same group.

5. How many members does your work unit have? Number: _____

6. How long have you been working for Brooklyn College?

Year(s) _____ Month(s) _____

7. Do you have a supervisor? ❍ Yes ❍ No
If you have multiple supervisors, please tell us to how many people you report:

Number: _____

8. Do you have subordinates? ❍ Yes ❍ No

If you have subordinates, please tell us how many people report to you:

Number: _____

9. Is there an established hierarchy within your group? ❍ Yes ❍ No

10. Please describe your work unit (structure and dynamics):

_____

_____

_____

_____

_____

_____

_____

_____

11. In this work unit, do you consider yourself:
❍ a junior member ❍ a senior member

12. At Brooklyn College, do you consider yourself:
❍ a junior member ❍ a senior member

Please estimate how well the following statements fit your group or organization using a scale from 1= "strongly disagree" to 6="strongly agree".

As before, please think about your work unit, unless otherwise specified.

For example:

The grass is always greener on the other side.

If you *strongly agree* with this statement, check the appropriate box below:

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍√	❍

Please answer the following questions with respect to your work unit.

Accountability

13. The members of my team are responsible for determining the methods, procedures, and schedules with which the work gets done.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

14. My team rather than my supervisor decides who does what tasks within the team.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

15. Most work-related decisions are made by the members of my team rather than by my supervisor.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Knowledge in Your Work Unit

16. All team members have the same level of basic knowledge relevant to our work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

18. Team members have very similar knowledge relating to our work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

19. All team members bring the same amount of knowledge into the discussion of the group's tasks.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

20. With regard to our work, all team members have their own special area of expertise.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

21. Our team has been put together so that we can complement each other's specific knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

22. Team members bring a wide spectrum of knowledge from different fields to our group.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

23. We complement each other's specialized knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

24. A successful result can only be achieved by combining our knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

25. The knowledge of every member is needed in order to work on the task.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

26. I would find it difficult to do my tasks without the suggestions of other group members.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

27. Without the knowledge of the other group members, I wouldn't be able to work as effectively.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

28. I usually know to whom to turn when problems occur.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

29. When I think that a particular team member can answer my question, I am usually right.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

30. I know very well who in the team can help me with a particular problem.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

31. If I don't know something, I know whom to ask.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

32. Team members exchange knowledge relevant to their work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

33. Knowledge is regularly exchanged between the team members.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

34. We often talk with each other about newly gained knowledge (e.g. training, specialized readings).

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

35. We frequently talk to each other about how the work is going.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

36. Each team member has specialized knowledge of some aspect of our project.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

37. I have knowledge about an aspect of the project that no other team member has.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

38. Different team members are responsible for expertise in different areas.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

39. The specialized knowledge of several different team members is needed to complete the project.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

40. I know which team members have expertise in specific areas.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

41. I am comfortable accepting procedural suggestions from the other team members.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

42. I trust that other members' knowledge about the project is credible.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

43. I am confident relying on the information that other team members bring to the discussion.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

44. When other members give information, I want to double-check it for myself.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

45. I do not have much faith in other members' "expertise".

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

46. Our team works together in a well-coordinated fashion.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

47. Our team has very few misunderstandings about what to do.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

48. Our team needs to backtrack and start over a lot.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

49. We accomplish the task smoothly and efficiently.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

50. There is much confusion about how we should accomplish tasks.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Knowledge Systems

51. There is a lack of rewards and recognition systems that would motivate people to share their knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

52. There is a general lack of time to share knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

53. There is a lack of formal and informal activities to cultivate knowledge sharing in my department.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

54. Existing culture in our department does not provide sufficient support for sharing knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

55. There is a lack of interaction between those who need knowledge and those who can provide knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

56. There is no system to identify the colleagues with whom I need to share my knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

57. Physical work environment and layout of work areas restrict effective knowledge sharing in my workplace.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

58. Staff is reluctant to seek knowledge from their seniors because of status fear.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

59. Staff in my department does not share knowledge because of the fear of it being misused by taking unjust credit for it.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

60. It is difficult to convince colleagues on the value and the benefits of the knowledge that I may possess.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

61. Staff in my department does not share knowledge because they think 'knowledge is power'.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

62. Staff does not share the knowledge because of poor verbal/written communication and interpersonal skills.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

63. Information Technology (IT) systems and processes are in place in my department to share knowledge.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

64. There is growing awareness on the benefit of knowledge sharing in my department.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

65. There exists a knowledge sharing strategy in my department.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Sharing and Exchanging

66. I cannot accomplish my tasks without information or materials from other members of my team.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

67. Other members of my team depend on me for information or materials needed to perform their tasks.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

68. Within my team, jobs performed by the team members are related to one another.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

69. My work goals come directly from the goals of my team.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

70. My work activities on any given day are determined by my team's goals for that day.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

71. I do very few activities on my job that are not related to the goals of my team.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

72. Feedback about how well I am doing my job comes primarily from information about how well the entire team is doing.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

73. My performance evaluation is strongly influenced by how well my team performs.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

74. Many rewards from my job (e.g. pay, promotion, etc.) are determined in large part by my contributions as a team member.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Work Environment

75. I feel I am being paid a fair amount for the work I do.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

76. There is really too little chance for promotion on my job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

77. My supervisor is quite competent in doing his/her job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

78. I am not satisfied with the benefits I receive.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

79. When I do a good job, I receive the recognition for it that I should receive.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

80. Many of our rules and procedures make doing a good job difficult.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

81. I like the people I work with.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

82. I sometimes feel my job is meaningless.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

83. Communications seem good within my work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

84. Raises are too few and far between.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

85. Those who do well on the job stand a fair chance of being promoted.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

86. My supervisor is unfair to me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

87. The benefits we receive are as good as most other organizations offer.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

88. I do not feel that the work I do is appreciated.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

89. My efforts to do a good job are seldom blocked by red tape.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

90. I find I have to work harder at my job because of the incompetence of people I work with.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

91. I like doing the things I do at work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

92. The goals of my work unit are not clear to me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

93. I feel unappreciated by Brooklyn College when I think about what they pay me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

94. People get ahead as fast here as they do in other places.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

95. My supervisor shows too little interest in the feelings of subordinates.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

96. The benefit package we have is equitable.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

97. There are few rewards for those who work here.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

98. I have too much to do at work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

99. I enjoy my coworkers.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

100. I often feel that I do not know what is going on with my work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

101. I feel a sense of pride in doing my job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

102. I feel satisfied with my chances for salary increases.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

103. There are benefits we do not have which we should have.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

104. I like my supervisor.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

105. I have too much paperwork.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

106. I don't feel my efforts are rewarded the way they should be.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

107. I am satisfied with my chances for promotion.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

108. There is too much bickering and fighting at work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

109. My job is enjoyable.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

110. Work assignments are not fully explained.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

111. Communications seem good within Brooklyn College.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

112. The goals of Brooklyn College are not clear to me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

113. I often feel that I do not know what is going on with Brooklyn College.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Work facilitation

114. I introduce people to each other who might have a common strategic work interest.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

115. I will try to describe an issue in a way that will appeal to a diverse set of interests.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

116. I see opportunities for collaboration between people.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

117. I point out the common ground shared by people who have different perspectives on an issue.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

118. I introduce two people when I think they might benefit from becoming acquainted.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

119. I forge connections between different people dealing with a particular issue.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer the following questions with respect to Brooklyn College and your work unit.

Support systems

120. Management at Brooklyn College is sincere in its attempts to meet the workers' point of view.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

121. Brooklyn College has a poor future unless it can attract better managers.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

122. If I got into difficulties at work, I know my workmates would try and help me out.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

123. Management can be trusted to make sensible decisions for Brooklyn College's future.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

124. I can trust the people I work with to lend me a hand if I needed it.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

125. Management at work seems to do an efficient job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

126. I feel quite confident that Brooklyn College will always try to treat me fairly.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

127. Most of my workmates can be relied upon to do as they say they will do.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

128. I have full confidence in the skills of my workmates.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

129. Most of my fellow workers would get on with their work even if supervisors were not around.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

130. I can rely on other workers not to make my job more difficult by careless work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

131. Our management would be quite prepared to gain advantage by deceiving the workers.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer the following questions with respect to your work unit.

Feedback Systems

132. It is easy to talk openly to all members of this work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

133. The information I receive is often inaccurate.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

134. I can think of a number of times when I received inaccurate information from others in this work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

135. Communication in this work unit is very open.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

136. It is often necessary for me to go back and check the accuracy of the information I've received.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

137. I sometimes feel that others don't understand the information they have received.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

138. I find it enjoyable to talk to other members of this work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

139. The accuracy of information passed among members of the work unit could be improved.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

140. When people talk to each other in this work unit, there is a great deal of understanding.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

141. It is easy to ask advice from any member of this work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Social Systems

142. Team members initiate work-related interaction with me very frequently.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

143. I initiate work-related interaction with team members very frequently.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

144. I interact with team members at work very frequently.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

145. I interact with team members very frequently informally or socially at work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to Brooklyn College.

Organizational Life

146. The size and complexity of Brooklyn College make it very difficult for an employee to know where to turn.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

147. The bureaucracy of Brooklyn College has me confused and bewildered.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

148. Life at Brooklyn College is so chaotic that the employee really doesn't know where to turn.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

149. There are forces affecting me at Brooklyn College that are so complex and confusing that I find it difficult to effectively make decisions.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

150. I can't seem to make much sense out of my Brooklyn College experience.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

151. My life is so confusing at Brooklyn College that I hardly know what to expect from day to day.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

152. In this fast-changing college, with so much conflicting information, it is difficult to think clearly about many issues.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to your department.

Departmental Life

153. The size and complexity of this department make it very difficult for a team member to know where to turn.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

154. The bureaucracy of this department has me confused and bewildered.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

155. Life in this department is so chaotic that a team member really doesn't know where to turn.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

156. There are forces affecting me at this department that are so complex and confusing that I find it difficult to effectively make decisions.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

157. I can't seem to make much sense out of my work experience at this department.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

158. My life is so confusing at this department that I hardly know what to expect from day to day.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

159. In this fast-changing department, with so much conflicting information, it is difficult to think clearly about many issues.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to your work and job itself.

Task Systems

160. I am certain how to go about getting my job done (the methods to use).

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

161. I know what is the best way (approach) to go about getting my work done.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

162. I know how to get my work done (what procedures to use).

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

163. I know when I should be doing a particular aspect (part) of my job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

164. I am certain about the sequencing of my work activities (when to do what).

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

165. My job is such that I know when I should be doing a given work activity.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

166. I know what my supervisor considers satisfactory work performance.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

167. It is clear to me what is considered acceptable performance by my supervisor.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

168. I know what level of performance is considered acceptable by my supervisor.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

169. On my job, I often have more than one boss telling me what to do.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

170. There are people I work with who do the same things I do.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

171. If I am unclear how to do something, there are others doing the same job that I can observe.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to your organization.

Future Outlook

172. I will probably look for a new job in the next year.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

173. I often think about quitting.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

174. It is very likely that I could find a job with another employer with about the same pay and benefits I have now.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

175. I would be very happy to spend the rest of my career with my organization.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

176. I really feel as if the problems of Brooklyn College are my own.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

177. I do not feel a strong sense of "belonging" to my organization.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

178. I do not feel "emotionally attached" to my organization.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

179. I do not feel like "part of the family" at my organization.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

180. My Organization has a great deal of personal meaning to me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

181. Right now, staying with my organization is a matter of necessity as much as desire.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

182. It would be very hard for me to leave my organization right now, even if I wanted to.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

183. Too much of my life would be disrupted if I decided I wanted to leave my organization now.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

184. I feel that I have too few options to consider leaving my organization.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

185. If I had not already put so much of myself into my organization, I might consider working elsewhere.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

186. One of the few negative consequences of leaving my organization would be the scarcity of available alternatives.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

187. I do not feel any obligation to remain with my current employer.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

188. Even if it were to my advantage, I do not feel it would be right to leave my organization now.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

189. I would feel guilty if I left my organization now.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

190. My organization deserves my loyalty.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

191. I would not leave my organization right now because I have a sense of obligation to the people in it.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

192. I owe a great deal to my organization.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer the following questions with respect to your work unit.

Support Systems

193. Our team is united in trying to reach its goals for performance.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

194. I'm unhappy with my team's level of commitment to the task.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

195. Our team members have conflicting aspirations for the team's performance.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

196. This team does not give me enough opportunities to improve my personal performance.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Motivation Systems

197. I have the feeling that it's up to me to do most of the work in my work unit.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

198. Even though we work together as a work unit, I have the feeling I do the work on my own.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

199. The other members of the work unit perform at their best.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

200. Some members shirk their responsibilities.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

201. Each of us gives his or her best.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

202. Some in the work unit let others do their work for them.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

203. Some members exploit the hard work of others.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

204. All members of the work unit take part equally in the group discussions.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

205. A task is often not done because no one feels responsible.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please only answer questions 206-209 if you are <u>a supervisor</u> or <u>have subordinates</u>. Otherwise, you can continue with question 210.

206. My subordinates fulfill the responsibilities specified in their job description.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

207. My subordinates perform the tasks that are expected as part of the job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

208. My subordinates meet performance expectations.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

209. My subordinates adequately complete their responsibilities.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to your supervisor.

Job Performance

210. Overall, I very much feel that my supervisor is performing his/her total job the way I would like it to be performed.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

211. I very much feel that my supervisor has met all of my expectations in his/her roles and responsibilities.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

212. I am very satisfied with the total contribution made by my supervisor.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

213. If I had my way, I would considerably change the manner in which my supervisor is doing his/her job.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to your work unit.

214. Overall, I very much feel that my team members are performing their total job the way I would like it to be performed.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

215. I very much feel that team members have met all of my expectations in their roles and responsibilities.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

216. I am very satisfied with the total contribution made by my team members.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

217. If I had my way, I would you considerably change the manner in which my team members do their jobs.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer the following questions with respect to Brooklyn College.

Open Systems

218. Brooklyn College values my contribution to its well-being.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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219. If Brooklyn College could hire someone to replace me at a lower salary it would do so.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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220. Brooklyn College fails to appreciate any extra effort from me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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221. Brooklyn College strongly considers my goals and values.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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222. Brooklyn College would ignore any complaint from me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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223. Brooklyn College disregards my best interests when it makes decisions that affect me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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224. Help is available from Brooklyn College when I have a problem.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

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225. Brooklyn College really cares about my well-being.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

226. Even if I did the best job possible, Brooklyn College would fail to notice.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

227. My organization is willing to help me when I need a special favor.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

228. My organization cares about my general satisfaction at work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

229. If given the opportunity, my organization would take advantage of me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

230. My organization shows very little concern for me.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

231. My organization cares about my opinions.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

232. Brooklyn College takes pride in my accomplishments at work.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

233. Brooklyn College feels that anyone could perform my job as well as I do.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

234. Brooklyn College tries to make my job as interesting as possible.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

235. The members of my team vary widely in their areas of expertise.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

236. The members of my team have a variety of different backgrounds and experiences.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

237. The members of my team have skills and abilities that complement each other.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Please answer these questions with respect to you own work experience.

Burnout

238. I often feel tired.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

239. I often feel disappointed with people.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

240. I often feel hopeless.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

241. I often feel trapped.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

242. I often feel helpless.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

243. I often feel depressed.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

244. I often feel physically weak or sick.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

245. I often feel worthless or like a failure.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

246. I often have difficulties sleeping.

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

247. I often feel like "I've had it".

strongly disagree	moderately disagree	slightly disagree	slightly agree	moderately agree	strongly agree
❍	❍	❍	❍	❍	❍
1	2	3	4	5	6

Final questions:

248. What is your age: _____

249. Sex (please select one):

❍ Female
❍ Male

250. Ethnicity (please select one):

❍ Black (Non-Hispanic/Latino)
❍ White (Non-Hispanic/Latino)
❍ Asian or Pacific Islander
❍ Hispanic
❍ Latino
❍ Caribbean Black
❍ Caribbean Indian
❍ American Indian or Native Alaskan
❍ If none of the above, please specify _____

251. Highest level of education completed (please select one):

❍ High School Diploma
❍ Some College (not yet completed)
❍ College degree (e.g. BA or BS)
❍ Some Graduate School (not yet completed)
❍ Graduate School Degree (e.g. MA, MS, MPH, PhD)

252. Do you have any further comments? Please let us know.

Thank you so much for your assistance with this project!
Your contribution is very helpful and important for my work.

THANKS!

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