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Effective Progression of Temporary Virtual Teams Over Time: a Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing

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Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing.

by

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A Thesis/Practicum Report submitted in partial fulfillment of the requirements for the degree of Master of Science in Database Technologies

School of Computer and Information Sciences
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School of Computer and Information Sciences
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Abstract

Enabled by communications and information technology, temporary virtual teams are able to utilize talent from anywhere in the globe to service customers, solve business problems, and provide unique educational experiences. Temporary virtual teams, however, face many challenges to their effectiveness. In particular, many challenges to effective communication and knowledge sharing exist. To be effective, methods intended to address the unique challenges presented in the temporary virtual team environment are needed. This paper presents practical methodologies that can be used towards the development of an internal structure to support knowledge sharing between temporary virtual teams.

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Chapter 1 – Introduction

Statement of Problem

Temporary virtual teams are groups of geographically and often temporally dispersed individuals who work on time limited projects with the aid of information and communication technology. The popularity of temporary virtual teams has increased as technology has evolved to enable their use in the workplace and academic environments.

In academic settings, temporary virtual teams may be used to provide a valuable educational experience to team members while providing services and value to non team members. Ideally, in such an environment, the benefits provided by the temporary virtual team will increase through time as iterations of the experience occur and knowledge is passed on and utilized by future teams. Future teams should benefit from knowledge discovered by previous teams, alleviating the time and resources necessary to re-discover knowledge. To achieve this benefit, the development of an internal structure to support the knowledge sharing phase of the knowledge management life cycle is necessary.

Statement of Goals and Objectives

The goal of this research is to evaluate the practical methodologies that support the development of an internal structure to support knowledge sharing between temporary virtual teams. As a member of a temporary virtual team responsible for providing database administrative support to university database students, the researcher will conduct a qualitative research study using an action research methodology to evaluate the socio-technical process of knowledge sharing with future teams.

Chapter 2 – Review of Literature and Research

Virtual Teams

Background and definition

Enabled by ongoing advancements in information and communications technology, many organizations have begun to explore and realize the benefits of virtual teams. Gibson and Cohen (2003) describe the potential benefits of virtual teams by stating, "Virtual teams that are designed, managed, and implemented effectively can harness talent from anywhere in the globe to solve business problems, service customers, and create new products" (p. 2). Qualifying this statement, Gibson and Cohen (2003) also express an important caveat in the implementation of virtual teams as "But if little attention is paid to how they are designed, managed, or supported, they will fail. Organizations must create the conditions for effective virtual teamwork" (p. 2).

Virtual teams can be designed in many ways and for different purposes. While virtual teams can differ in their design and purpose, they share a few distinct attributes. Common attributes among virtual teams include the collaboration of independent individuals as a functioning team sharing responsibility for desired outcomes, geographically dispersed team members, and a reliance on communications and information technology as a means for communication in the absence of face-to-face interaction between team members (Gibson & Cohen, 2003; Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000).

Virtual teams can vary greatly in the extent of their virtuality. Describing this variance, Gibson and Cohen (2003) state, "We see virtuality as a continuum. Virtual teams range in their degree of virtuality, from slightly virtual to extremely virtual" (p. 5). Two of the primary attributes that define virtual teams can be examined to determine the degree of a team's virtuality. The extent to which a virtual team is reliant on communication and information

technology in addition to the extent to which the team is geographically dispersed help to define the level of virtuality of a team. As pointed out by Gibson and Cohen (2003), "A team that does all its work through e-mail, text exchanges, and teleconferences, never meeting face-to-face, is more virtual than a team that meets monthly face-to-face" (p. 5). Furthermore, teams dispersed across temporal and spatial boundaries can be considered more virtual than teams located in the same geographic location.

Temporary Virtual Teams

Some virtual teams posses the additional attribute of being limited in the amount of time allocated to achieve their desired outcome. "This is not a defining characteristic of the virtual team but rather a byproduct of the specialized function they often serve" (Powell, Piccoli & Ives, 2004, p. 7). Virtual teams defined as temporary can also be described as teams whose members have not worked together in the past, and where there is no implication of team members working together again in the future (Jarvenpaa & Ives, 1994; Lipnack & Stamps, 1997). Additionally, the process of relationship building in temporary virtual teams is impeded by their temporary nature (Jarvenpaa & Leidner, 1998).

Challenges and enabling conditions

While the potential benefits of virtual teams are many, they face unique challenges to their success. The correlation between the virtuality of a team and the challenges, complexity, and barriers to effectiveness which it may encounter is high (Gibson & Cohen, 2003; Jarvenpaa & Leidner, 1998; Powell, Piccoli & Ives, 2004). Because members of temporary virtual teams are spread across spatial, temporal, and cultural borders, factors vital to the team's success including trust, identity, coordination, leadership, and knowledge sharing become more challenging and difficult to manage. The ambiguity encountered by team members as a result of

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the reliance on information and communications technologies in lieu of face-to-face communications creates barriers to the effectiveness of virtual teams (Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000; Ocker & Fjermestad, 2008). Cuevas, Fiore, Salas and Bowers (2004) "argue that technology-mediated interactions increase the level of abstraction forced upon teams — a phenomenon referred to as team opacity…. Essentially, team opacity describes the experience of increased ambiguity and artificiality (i.e., the unnatural quality) associated with interaction in distributed environments" (p. 3).

The literature suggests that many enabling factors including shared understanding, mutual trust, and knowledge management activities are necessary for virtual teams to be effective (Gibson & Cohen, 2003; Hinds & Weisband, 2003; Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000; Ocker & Fjermestad, 2008). Additionally, managers need to be aware of and posses the skills necessary to provide the unique leadership and motivational requirements of virtual teams. Because communications via electronic media are so vital to virtual teams, it is essential that managers and leaders are able to effectively utilize that media to create clear organizational structures, articulate role clarity, facilitate and encourage communication, and improve socio-emotional relationships among virtual team members (Kayworth & Leidner, 2002). As stated by Fisher and Fisher (2000), "Many of the traditional skills and perspectives that aided the manager who led people located in a single building fall far short of meeting the need…. New management strategies and techniques are needed" (p. xv).

Many individual capabilities are needed for virtual team members to be able to work effectively with their teammates. As stated by Gibson and Cohen (2003), "First, they need sufficient task-related knowledge and skills. They also need to have the skills to work collaboratively in virtual space" (p. 10). The ability to accept and tolerate a high degree of

ambiguity in virtual team communications as well as the ability or desire to work with people who may posses different cultural perspectives are also desirable traits for virtual team members (Gibson & Cohen, 2003; Vinaja, 2003). Additionally, Staples, Wong, and Cameron (2004) identify "communicating effectively, having appropriate skills, being motivated, being supportive of other team members, and being action oriented" (p. 175) as five general characteristics of effective virtual team members.

To perform well, virtual teams members need to develop a shared understanding of the team's goals, the methods for achieving those goals and the tasks the team must perform. Additionally, a shared understanding of team member's knowledge and skills is needed for effective team performance. There are many benefits for virtual teams when they develop a shared understanding in these areas including a greater ability to predict the behaviors of team members, a more efficient use of resources and effort, fewer errors, increased satisfaction and motivation among team members, as well as a reduction in frustration and conflict among team members (Hinds & Weisband, 2003). As stated by Powell, Piccoli, and Ives (2004), "Designing team interaction that requires the setting of goals and strategies leads to the achievement of shared mental models" (p. 9). To achieve these benefits, Hinds and Weisband (2003) recommend the following practices for facilitating shared understanding in virtual teams:

1. Compose teams in which members have similar backgrounds.

2. Highlight and emphasize similarities among team members.

3. Facilitate sharing of personal information, especially early in the project.

4. Facilitate sharing of information about day-to-day activities throughout the project.

5. Identify essential knowledge that is needed on the project and make sure that this knowledge is shared, especially across sites.

6. Encourage face-to-face meetings with team members early in the project and periodically throughout longer, more difficult projects.

7. Encourage team members to visit the work locations of other team members.

8. Build a strong team identity.

9. Keep turnover low.

10. Provide easy access to and support for (including training and technical support) videoconferencing and on-line team spaces.

(p. 35).

It is important to consider the list of facilitating practices when designing and implementing effective virtual teams. While each of these practices may help to facilitate a shared understanding among team members, it is not always possible to utilize all of these practices. As previously noted by Jarvenpaa and Leidner (1998), the process of relationship building in temporary virtual teams is impeded by their temporary nature. This is due in part to the fact that temporary virtual teams are unable to incorporate certain facilitating practices such as keeping turnover low. Additionally, time and budget constraints often preclude such facilitating practices as face-to-face meetings and the visitation of team member's work sites. Moreover, the use of technology as an enabler of shared understanding may be limited due to a lack of technical training, support, and reliability (Hinds & Weisband, 2003).

Trust is an essential factor to consider in the effective formation and functioning of virtual teams (Gignac, 2004; Hinds & Weisband, 2003; Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000). According to Gignac (2004), if a virtual team is to achieve its purpose "it must build a foundation of teamwork and trust for collaboration to truly happen and for performance to be achieved" (p. 21). While many of the basic tenets of trust are challenged by the reliance of

temporary virtual teams on electronic communication methods rather than face-to-face communications, early research in the virtual environment has suggested that short-lived teams are able to develop a high level of trust. In this research, this high level of trust is achieved by adhering to a swift trust model (Jarvenpaa & Leidner, 1998; Kramer & Tyler, 1996; Powell, Piccoli, & Ives, 2004).

As a basis for the concept of swift trust, Kramer and Tyler (1996) explain "As an organizational form, temporary groups turn upside down traditional notions of organizing….Moreover, there isn't time to engage in the usual forms of confidence-building activates that contribute to the development and maintenance of trust in more traditional, enduring forms of organization" (p. 167). The concept of swift trust applies to temporary teams designed with a common goal and a finite life span. Swift trust implies a willingness by team members to suspend doubt about whether others, whom they are unfamiliar with, can be counted on in order to accomplish the group's goals. With swift trust, team members assume their teammates are trustworthy and bypass the more traditional and time-consuming methods of building trust (Kramer & Tyler, 1996). The perceived integrity of team members associated with the swift trust concept can be especially beneficial in the early phases of temporary virtual teams, although it may also help to facilitate the additional building and maintenance of trust over time (Jarvenpaa & Leidner, 1998). This is supported by the suggestion of Kramer and Tyler (1996) that after the initial trust among team members enabled by the concept of swift trust diminishes, that trust is maintained by a "highly active, proactive, enthusiastic, generative style of action" (p. 180). Additionally, Jarvenpaa and Leidner (1998) state, "Action strengthens trust in a self-fulfilling fashion: action will maintain members' confidence that the team is able to manage the uncertainty, risk and points of vulnerability, yet the conveyance of action has as a requisite the

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communication of individual activities" (p. 5). Similar to the importance of trust that Davenport and Prusak (1998) attribute to the effective transfer of knowledge through the organization, Gibson and Cohen (2003) state, "We have found that task notions of trust based on reliability and responsiveness are likely the most critical in virtual teams" (p. 19).

Based on a series of case studies of global virtual teams, Jarvenpaa and Leidner (1998) categorize characteristics of communication behaviors and team member actions that appear to facilitate the existence of trust in virtual teams. Additionally, these characteristics are subdivided into two groups. The first group contains those characteristics that appear to facilitate trust early on, and the second group identifies those characteristics that may help maintain trust in the later stages of virtual teams. A summary of these characteristics is presented in Table 1.

Table 1.

Trust Facilitating Communication Behaviors and Member Actions

Communication Behaviors Facilitating Trust Early On	Member Actions Facilitating Trust Early On	Communication Behaviors Maintaining Trust Later on	Member Actions Facilitating Trust Later On
Social Communication	Coping with Technical and Task Uncertainty	Predictable Communication	Leadership
Communication Conveying Enthusiasm	Individual Initiative	Substantive and Timely Response	Transition from Procedural to Task Focus
			Phlegmatic Reaction to Crisis

(Jarvenpaa and Leidner, 1998, Table 5).

The research of Jarvenpaa and Leidner suggests a strong correlation between the amount of social communication and initial trust in the studied teams. Members of teams identified as displaying a high level of initial trust had engaged in more social exchanges early in the team's existence. These non-task exchanges about topics such as families, hobbies, and weekend activities "appeared to foster trust in the beginning of the project but was insufficient in

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maintaining trust over the longer term" (Jarvenpaa & Leidner, 1998). This research supports Hinds and Weisband's statement, "Especially if their common background is not apparent, a manager can help to establish common ground by identifying and pointing out to team members where they share interests or experiences…. managers can point out shared hobbies, shared family situations, and so forth…. On this foundation, shared understanding can be built" (2003, p. 32).

Communication conveying enthusiasm also appeared to increase the level of initial trust among team members. When team members described their team as a *virtual family* or a *virtual party*, they displayed a higher level of initial trust. Jarvenpaa and Leidner state that high trust teams "encouraged each other on the task, with such statements as, 'everyone just keep pulling together and we can do this'…The teams that moved from low to high trust expressed enthusiasm and optimism as the project progressed" (1998). Similarly, Hinds and Weisband (2003) state, "Another way to facilitate shared understanding in virtual teams is to increase team spirit or team identity. Managers can increase team identity by ensuring that the team has an overriding goal in which team members believe" (p. 34).

When the team members studied by Jarvenpaa and Leidner were able to develop a system of coping with technical uncertainty and unstructured tasks, they displayed higher levels of initial trust. High trust teams were more pragmatic in how they approached technical and task uncertainty. For example, in order to be aware of missing messages, team members developed a message numbering scheme. High trust teams also exchanged more messages intended to clarify understanding and to develop consensus (Jarvenpaa & Leidner, 1998). While describing the characteristics that effective virtual team members need to possess, Gibson and Cohen (2003)

state, "Team members need to have a tolerance for ambiguity to deal with the unstructured communication that characterizes much of virtual teamwork" (p. 10).

The initial trust in team members studied by Jarvenpaa and Leidner was higher when the team members took initiative in making suggestions and decisions. Conversely, low trust team members were more likely to wait for others to make decisions. In reference to the role of electronic communications in this issue, Jarvenpaa and Leidner point out, "Furthermore, the teams ending with low trust revealed simple task ideas and solutions with little explanation. One cannot blame the medium for the lack of richness in their ideas; rather, the members simply failed to provide details with their ideas" (1998).

Jarvenpaa and Leidner studied the effects of predictable communication as a behavior for maintaining trust later in the team's life cycle and determined that "Inequitable, irregular, and unpredictable communication hindered trust" (1998). Similarly, Hinds and Weisband (2003) point out, "Team members benefit from a shared understanding of the interaction anticipated among team members, including roles and responsibilities, interdependencies, communication patterns, and expectations for the flow of information" (p. 24). Additionally, high trust teams differed in the way they communicated when compared low trust teams. In their communications, the high trust teams provided more substantive and timely responses than low trust teams (Jarvenpaa & Leidner, 1998). As noted earlier, Gibson and Cohen (2003) recognize the importance of predictable and responsive communications when they state, "We have found that task notions of trust based on reliability and responsiveness are likely the most critical in virtual teams" (p. 19).

Jarvenpaa and Leidner found in their research that positive leadership facilitated trust later in the life cycle of the teams studied. As opposed to low trust teams where the leadership

engaged in negative reinforcement, the leadership in the high trust team maintained a positive tone in their communications. Additionally, leaders and managers facilitate trust and are more successful when they are able to keep team members on task by creating awareness about team members' progress. Managers can increase team identity and trust by ensuring that the team members understand and believe in the team's goals (Hinds & Weisband, 2003). According to Gignac (2004), "facilitation strategies must be carefully planned and deployed so that the attitude of 'one for all and all for one' is able to emerge and collaboration can truly occur. Indeed, collaboration cannot be forced on people. It can only be facilitated" (p. 183). Furthermore, as noted previously, it is essential that managers and leaders are able to create clear organizational structures, articulate role clarity, facilitate and encourage communication, and improve socio-emotional relationships among virtual team members (Kayworth & Leidner, 2002). Fisher and Fisher (2000) emphasize the importance of recognizing and celebrating individual and team accomplishments. Due to the added complexity of the virtual environment, managers need to be more creative in their efforts to reward the team and its members for achieving goals and milestones. Jarvenpaa and Leidner also report that teams able to transition their focus from rules and procedures to tasks displayed a higher level of trust. High trust teams also appeared to be more able to maintain their composure in reaction to crisis than low trust teams (Jarvenpaa & Leidner, 1998). Staples, Wong, and Cameron (2004) include "setting goals and direction, providing feedback, building trust, empowering team members, motivating team members, having appropriate leadership styles, and developing self-control mechanisms in team members" (p. 170) as seven general team leader best practices.

Research has suggested that knowledge management activities enable the effectiveness of temporary virtual teams. This has been demonstrated in a study of communication differences

between high and low performance temporary virtual teams conducted by Ocker and Fjermestad (2008). In this study, team members communicated and collaborated solely via asynchronous computer-mediated communication for a duration of between fourteen and seventeen days. At the conclusion of each experiment, expert judges rated the quality and creativity of each team's solutions to assigned tasks. In their summary, the researchers noted that it was likely that the high performance teams experienced coordination and overload difficulties due to the significantly higher amount of back and forth critical debate. However, Ocker and Fjermestad (2008) also point out that these high performance teams "incorporated two emergent structures pertaining to knowledge management to counter these drawbacks of asynchronous interaction: (1) reviewing the knowledge repository created as a result of their electronic communication, and (2) summarizing content" (Ocker & Fjermestad, 2008, p. 63).

In these high performing teams, a team member would add structure to the team's discussion content by summarizing and organizing that content. This structuring process served to organize the team's work, and keep all the team members up to date on relevant topics. Additionally, it provided a forum where team members could review the summarized data and make sure their ideas were accurately represented. The existence of summarized knowledge and information greatly enhanced the high performance team's ability to create the reports necessary to complete their tasks (Ocker & Fjermestad, 2008).

Conversely, low performance teams failed to implement knowledge management activities, resulting in a limited capability to produce reports. In concluding their research, Ocker and Fjermestad (2008) state, "actively attending to the management of knowledge, perhaps by designating the role of knowledge manager within the team, may be a simple means of reaping

the benefits of knowledge management without increasing the complexities of the communication technology" (p. 65).

The process of summarization engaged in by the high performance temporary virtual teams in Ocker and Fjermestad's study is also referred to as codification. According to Davenport and Prusak (1998), "The aim of codification is to put organizational knowledge into a form that makes it accessible to those who need it. It literally turns knowledge into a code (though not necessarily a computer code) to make it as organized, explicit, portable, and easy to understand as possible" (p. 68). Through the process of codification, knowledge managers and users enable the sharing and transfer of knowledge. However, care must be taken in the codification process in order to retain the distinctive properties and value of the stored knowledge. As Davenport and Prusak (1998) point out, "some structure for knowledge is necessary, but too much kills it" (p. 68).

Knowledge creation and the sharing or transfer of knowledge

Virtual teams play an important role in the creation of knowledge by providing a common, shared context where interaction, dialog, and the sharing of ideas occur. In this context, multiple individual perspectives are presented, integrated, and reflected upon resulting in a new collective perspective (Nonaka, 1998). Because teams provide a shared context where interaction and idea sharing occurs between team members, they afford an environment suitable for the genesis of knowledge. As Sveiby (1997) states, "We are constantly generating new knowledge by analyzing the sensory impressions we receive (and the more senses we employ in the process, the better)" (p. 31).

Sveiby's statement illustrates two important fundamental aspects of virtual teams with regard to knowledge creation and sharing. The first aspect is that the analysis of sensory

impressions inherent in team dialog and interaction provides the basis or opportunity for knowledge creation. The second aspect is that the more senses we employ in this analysis, the better the potential for generating new knowledge. The second aspect is especially important for virtual teams because as teams become more virtual, there is less opportunity for face-to-face interaction between team members. This in turn limits the availability of sensory impressions necessary for knowledge creation and sharing.

As Hinds and Weisband (2003) relate, "Face-to-face interaction provides rich social information not available through most communication technologies....When interacting face-to-face, people rely heavily on voice intonation, facial expressions, and gestures for cues to help interpret meaning" (pp. 29-30). This limitation of virtual teams is also supported by Davenport and Prusak (1998) as they state, "Transferring knowledge through personal conversations is being threatened not only by industrial-age managers but also by the move to 'virtual offices'" (p. 91).

When the goal is to transfer or share knowledge between team members, it is advantageous to identify the type of knowledge to be shared. The type of knowledge to be shared will affect the difficulty and method of sharing or transfer. According to Davenport and Prusak (1998):

Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (p. 3).

To better understand knowledge in a more practical sense, it is helpful to differentiate between two different types of knowledge – tacit and explicit.

Tacit knowledge is contained in people's minds often in the form of mental models or beliefs. It may be acquired through apprenticeships or by observation. It can be thought of as the know-how that is gained through the complex and time consuming process of learning a craft or a profession. Tacit knowledge is so highly personal to the knower, that it is hard to fully articulate and share (Nonaka, 1998).

Explicit knowledge on the other hand is more formal. It is the form of knowledge found in documents or procedures. According to Nonaka (1998), "Explicit knowledge is formal and systematic. For this reason, it can be easily communicated and shared, in product specifications or a scientific formula or a computer program" (p. 27).

Davenport and Prusak (1998) provide a simple formula for knowledge transfer, "Transfer = Transmission + Absorption (and Use)" (p. 101), which they further describe as "Knowledge transfer involves two actions: transmission (sending or presenting knowledge to a potential recipient) and absorption by that person or group" (p. 101). Additionally, they enhance their description by distinguishing between the transfer of tacit and explicit knowledge. In doing so, they provide two useful metaphors. The first is that the speed with which knowledge can be transferred can be referred to as the velocity of transfer, with the second being that the richness of the knowledge transferred may be referred to as the viscosity of transfer (Davenport & Prusak, 1998). Similar to the relationship between the viscosity of motor oil, and the velocity at which it may flow, Davenport and Prusak (1998) explain that the factors behind the velocity and viscosity of knowledge transfer are often at odds with each other and state, "What enhances velocity may

thin the viscosity. Most knowledge transfer efforts strike a compromise between these two factors" (p. 103).

Nonaka's suggestion that richer tacit knowledge is more difficult and time consuming to share than explicit knowledge is illustrated by the following statements made by Davenport and Prusak (1998): "Knowledge transferred by means of a long apprenticeship or mentoring relationship is likely to have a high viscosity: the receiver will gain a tremendous amount of detailed and subtle knowledge over time" (p. 102) and "Knowledge retrieved from an on-line database or acquired by reading an article will be much thinner" (pp. 102-103).

Knowledge Management Solutions

According to Davenport and Prusak (1998), "Knowledge is transferred in organizations whether or not we manage the process at all" (p. 88). Knowledge is often transferred in an informal and unstructured manner through events that occur in everyday organizational life. Regardless of whether the event is a planned event such as a meeting, or an unplanned event such as a random conversation at the water cooler, an important opportunity for knowledge transfer exists. Noting the importance of informal, unstructured knowledge transfer, Davenport and Prusak (1998) state, "Spontaneous, unstructured knowledge transfer is vital to a firm's success" (p. 89). They also recognize that any formal strategy for knowledge management should not forget the importance of informal knowledge transfer methods as they point out "Although the term *knowledge management* implies formalized transfer, one of its essential elements is developing specific strategies to encourage such spontaneous exchanges" (Davenport & Prusak, 1998, p. 89).

Sometimes, certain conditions exist to limit the effectiveness of informal, unstructured knowledge sharing methods such as face-to-face conversations. Often, these methods for

transferring knowledge are local and fragmentary. While important knowledge may be

transferred in a chance encounter with a fellow employee in the hallway, for example, this is

hardly a reliable method for the transference of knowledge in a time of need (Davenport &

Prusak, 1998). Also, the increased use of virtual teams has become an important factor which

challenges traditional informal knowledge sharing methods. Temporally and spatially dispersed

virtual teams, enabled by information and communication technologies, face unique knowledge

sharing and transfer challenges (Gibson & Cohen, 2003; Jarvenpaa & Leidner, 1998; Powell,

Piccoli & Ives, 2004).

These challenges suggest that the need for a more structured approach to both knowledge

sharing and the broader topic of knowledge management is needed. In response to these

challenges, Becerra-Fernandez, Gonzalez, and Sabherwal (2004) describe a variety of knowledge

management solutions intended to facilitate effective knowledge management. As a basis for

knowledge management solutions, Becerra-Fernandez et al. (2004) define knowledge

management as "performing the activates involved in discovering, capturing, sharing, and

applying knowledge so as to enhance, in a cost-effective fashion, the impact of knowledge on the

unit's goal achievement" (p.31).

The knowledge management solutions described by Becerra-Fernandez et al. (2004), may

be divided into four broad levels including (1) knowledge management processes, (2) knowledge

management systems, (3) knowledge management mechanisms and technologies, and (4)

knowledge management infrastructure. Describing the relationship between the four levels of

knowledge management (KM) solutions, Becerra-Fernandez et al. (2004) state, "KM

infrastructure supports the KM mechanisms and technologies, and KM mechanisms and

technologies are used in KM systems that enable KM processes" (p. 32). This relationship is

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illustrated in Figure 1 below. Additionally, the curved arrows in Figure 1 highlight how the KM infrastructure may benefit over time from both KM systems and KM mechanisms and technologies (Becerra-Fernandez et al., 2004).
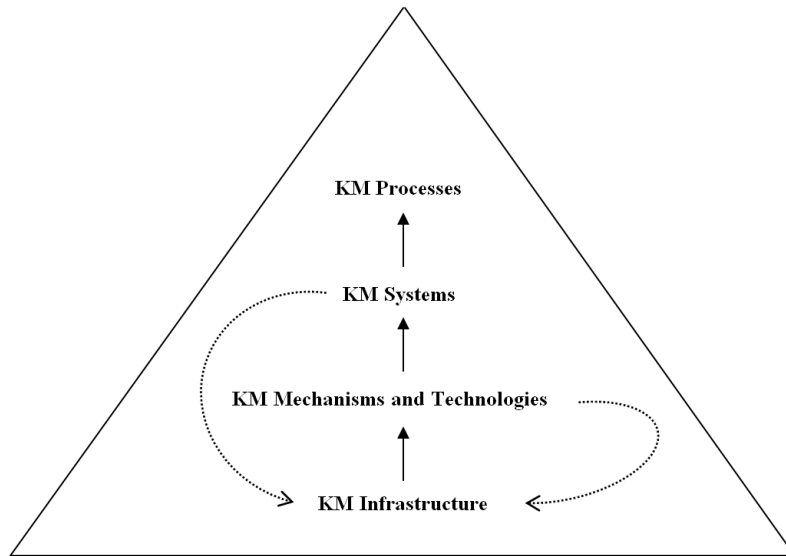
Figure 1. Overview of Knowledge Management Solutions (Becerra-Fernandez et al., 2004, p. 31)

Knowledge Management Processes

According to Becerra-Fernandez et al. (2004), "KM processes are the broad processes that help in discovering, capturing, sharing, and applying knowledge" (p. 31). These four processes are supported by seven KM subprocesses as is illustrated in Figure 2.
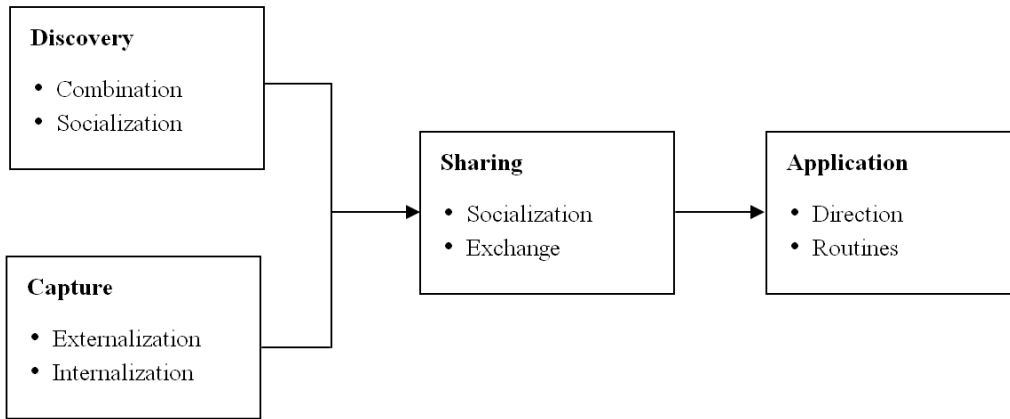
Figure 2. Knowledge Management Processes (Becerra-Fernandez et al., 2004, p. 32)

Four of the KM subprocesses including socialization, combination, externalization, and internalization are based on the four modes of knowledge conversion described by Nonaka (1994). While new knowledge always begins with the individual, these four modes of knowledge conversion exist in dynamic interaction as a kind of spiral of knowledge (Nonaka, 1998). According to Nonaka (1994):

> The assumption that knowledge is created through conversion between tacit and explicit knowledge allows us to postulate four different "modes" of knowledge conversion: (1) from tacit knowledge to tacit knowledge, (2) from explicit knowledge to explicit knowledge, (3) from tacit knowledge to explicit knowledge, and (4) from explicit knowledge to tacit knowledge (p. 18).

Figure 3 illustrates the four KM subprocesses resulting from the conversion of tacit and explicit knowledge in Nonaka's four modes of knowledge conversion.

	Tacit knowledge	*To*	Explicit knowledge
Tacit knowledge	Socialization		Externalization
From **Explicit knowledge**	Internalization		Combination

Figure 3. Modes of Knowledge Conversion (Nonaka, 1994, p. 19).

The first mode of conversion where tacit knowledge is converted to tacit knowledge through the interaction between individuals is known as socialization. Socialization is a process where the sharing of experiences, such as shared mental models and skills, takes place resulting in the creation of tacit knowledge (Nonaka, 1994).

The second mode of conversion where explicit knowledge is converted to explicit knowledge by incorporating the use of social processes to combine different sources of explicit knowledge is known as combination (Nonaka, 1994). Sveiby (1997) describes Nonaka's concept of combination as "the process of systemizing explicit concepts into a knowledge system, that is, combining different bodies of explicit knowledge into new explicit knowledge by analyzing, categorizing, and reconfiguring information" (p. 48).

The third mode of conversion where tacit knowledge is converted to explicit knowledge is known as externalization. When an individual is able to articulate the foundations of their tacit knowledge, they are converting it to explicit knowledge. When tacit knowledge is converted to explicit knowledge, it may be shared with others more easily (Nonaka, 1998).

The fourth mode of conversion where explicit knowledge is converted to tacit knowledge is known as internalization. The process of internalization is similar to the traditional notion of learning (Nonaka, 1994). According to Nonaka (1998), "as new explicit knowledge is shared

throughout an organization, other employees begin to internalize it-that is, they use it to broaden, extend, and reframe their own tacit knowledge" (p. 29).

The KM subprocess of exchange describes the sharing of explicit knowledge through the transfer or communication of information between individuals, groups, and organizations (Becerra-Fernandez et al., 2004; Grant, 1996a). Becerra-Fernandez et al. (2004) provide the transference of a product design manual from one employee to another as an example of the exchange of explicit knowledge.

The two remaining subprocesses, direction and routines, are specific to the KM process of knowledge application. These KM subprocesses, which are useful in the application of available knowledge rather than the exchange or transfer of knowledge, refer to mechanisms for the integration of specialized knowledge (Becerra-Fernandez et al., 2004; Grant, 1996a).

Demsetz (1991) defines direction in this context as a "low cost method of communicating between specialists and the large number of persons who either are non-specialists or who are specialists in other fields" (p. 172). When individuals possessing specialized knowledge direct the actions of other individuals without actually transferring their tacit knowledge, they are in effect providing a mechanism where that knowledge may be converted into more easily understood explicit knowledge such as rules or procedures (Becerra-Fernandez et al., 2004; Grant, 1996a).

According to Grant (1996b), "An organizational routine provides a mechanism for coordination which is not dependent upon the need for communication of knowledge in explicit form" (p. 379). While the complex patterns of behavior embodied in routines may take time to develop, they offer advantages over direction including economizing on communication and a

greater capacity to vary responses to a broad range of circumstances (Grant, 1996a; Grant, 1996b).

Becerra-Fernandez et al. (2004) define the KM process of knowledge discovery as "the development of new tacit or explicit knowledge from data and information or from the synthesis of prior knowledge" (p. 33). Discerning between the discovery of tacit versus explicit knowledge, tacit knowledge is discovered through the KM subprocess of socialization and explicit is discovered through the KM subprocess of combination (Becerra-Fernandez et al., 2004; Nonaka, 1994).

While socialization is generally believed to refer to the synthesis of tacit knowledge between individuals through joint activities requiring face-to-face contact such as apprenticeships, successful examples of socialization in virtual communities exist. For example, in their research of the Linux kernel development project, Lee and Cole (2003) "build a model of community-based, evolutionary knowledge creation to study how thousands of talented volunteers, dispersed across organizational and geographical boundaries, collaborate via the internet to produce a knowledge intensive, innovative product of high quality" (p. 633). Their work suggests that through the processes of mutual criticism and software code evaluation, a context for new knowledge creation by socialization was provided in these virtual communities. Moreover, when the multiple sources of explicit knowledge contributed by the many participants in these virtual communities were aggregated, the opportunity for knowledge creation by combination was effectively provided (Peddibhotla and Subramani, 2008).

The KM process of knowledge capture is defined by Becerra-Fernandez et al. (2004) as "the process of retrieving either explicit or tacit knowledge that resides within people, artifacts, or organizational entities" (p. 33). The capture of tacit knowledge benefits from the KM

subprocess of externalization. Becerra-Fernandez et al. (2004) explain the documentation of lessons learned about a client organization by a consulting team as an example of externalization. Additionally, management books are examples of externalization. Inversely, the capture of explicit knowledge benefits from the KM subprocess of internalization. According to Sveiby (1997), "Internalization is helped along if the knowledge is verbalized as oral stories or if systems document processes are used. Simulations are another way to accomplish this mode of knowledge conversion" (p. 48).

The KM process of knowledge sharing is accomplished when tacit or explicit knowledge is communicated to other individuals, groups, departments, or organizations in a manner such that the recipient can understand it well enough to act on it (Becerra-Fernandez et al., 2004; Jensen & Meckling, 1996; Alavi & Leidner, 2001). The sharing of tacit knowledge is facilitated by the KM subprocess of socialization while explicit knowledge sharing is enabled by the KM subprocess of exchange. It is important to note that effective knowledge sharing involves the sharing of actual knowledge rather than recommendations based on the knowledge (Becerra-Fernandez et al., 2004). More in depth examples of knowledge sharing will be presented in a following section of this review of literature.

The KM process of knowledge application is dependent on available knowledge. According to Becerra-Fernandez et al. (2004), "In applying knowledge, the party that makes use of it does not necessarily need to comprehend it. All that is needed is that somehow the knowledge is used to guide decisions and actions" (p. 35). Described previously in this review, direction and routines are the KM subprocesses that facilitate knowledge application.

Knowledge Management Systems, Mechanisms and Technologies

Knowledge management systems are developed to support the four KM processes of knowledge discovery, capture, sharing, and application. KM systems utilize KM mechanisms and technologies which are in turn supported by the KM infrastructure (Becerra-Fernandez et al., 2004). A summary of KM processes, subprocesses, systems, facilitating mechanisms, and technologies are presented in Table 2.

Table 2.

Components of Knowledge Management Solutions

KM Process & System	KM Subprocess	Facilitating Mechanisms	Facilitating Technologies
Discovery	Combination	▪ Collaborative problem solving ▪ Joint decision making ▪ Meetings ▪ Telephone Conversations ▪ Documents ▪ Collaborative creation of documents	▪ Knowledge discovery systems ▪ Databases and data mining ▪ Repositories of information ▪ Web portals ▪ Best practices and Lessons learned databases ▪ Web-based access to data
	Socialization	▪ Apprenticeships ▪ Conferences ▪ Brainstorming retreats ▪ Cooperative projects across departments ▪ Employee rotation across areas ▪ Initiation process for new employees	▪ Video-conferencing ▪ Electronic support for communities of practice ▪ Electronic dicussion groups ▪ E-mail
Capture	Externalization	▪ Development of models or prototypes ▪ Articulation of best practices and lessons learned	▪ Intelligent technologies such as expert systems ▪ Best practices and Lessons learned databases ▪ Chat groups ▪ Case-based reasoning systems
	Internalization	▪ Learning by doing ▪ On-the-job training ▪ Learning by observation ▪ Face-to-face meetings	▪ Computer-based training ▪ Communication technologies ▪ AI-based knowledge acquisition ▪ Computer-based simulations
Sharing	Exchange	▪ Memos ▪ Manuals ▪ Progress reports ▪ Letters ▪ Presentations	▪ Groupware and other team collaboration mechanisms ▪ Web-based access to data ▪ Databases ▪ Repositories of information Including best practice databases Lessons learned systems and Expertise locator systems
	Socialization	▪ Apprenticeships ▪ Conferences ▪ Brainstorming retreats ▪ Cooperative projects across departments ▪ Employee rotation across areas ▪ Initiation process for new employees	▪ Video-conferencing ▪ Electronic support for communities of practice ▪ Electronic dicussion groups ▪ E-mail
Application	Direction	▪ Traditional hierarchical relationships in organizations ▪ Help desks ▪ Support centers	▪ Experts' knowledge embedded in expert systems ▪ Decision support systems ▪ Troubleshooting systems based on the use of technologies like case-based reasoning
	Routines	▪ Organizational policies ▪ Work practices ▪ Standards	▪ Expert systems ▪ Enterprise resource planning systems ▪ Traditional management information systems

(Becerra-Fernandez et al., 2004, p. 41)

Knowledge Management Infrastructure

The KM infrastructure provides the foundation for the KM solutions described by Becerra-Fernandez et al. (2004). It is composed of five main components including organization culture, organization structure, information technology infrastructure, common knowledge, and the physical environment.

Explaining the importance of organizational culture, Davenport and Prusak (1998) state, "Extensive knowledge transfer could not happen in large global companies without the tools provided by information technology, but the values, norms, and behaviors that make up a company's culture are the principal determinants of how successfully important knowledge is transferred" (p. 96). Similarly, Becerra-Fernandez et al. (2004) accentuate the findings of a survey of KM practices in U.S. companies performed by Dyer and McDonough (2001) which "indicated that the four most important challenges in KM are nontechnical in nature, and include, in order of importance: (1) the organization's employees have no time for KM; (2) the current organization culture does not encourage knowledge sharing; (3) inadequate understanding of KM and its benefits to the company; and (4) inability to measure the financial benefits from KM" (p. 40).

An organization's structure is also an important component of the KM infrastructure. As stated by Becerra-Fernandez et al. (2004), "the hierarchical structure of the organization affects the people with whom individuals frequently interact, and to or from whom they are consequently likely to transfer knowledge" (p. 42). Moreover, the creation of specialized structures and roles in support of KM serves to facilitate the KM processes as well as reinforce and highlight the importance that the organization places on KM (Becerra-Fernandez et al., 2004; Davenport & Prusak, 1998).

Information technology is another important component of the KM infrastructure as it is a key enabler of KM processes. Davenport and Prusak (1998) state, "As a general rule, though, the more rich and tacit knowledge is, the more technology should be used to enable people to share that knowledge directly" (p. 96). They also point out that the velocity of knowledge is enhanced with information technology such as computers and networks. Information technology enables KM processes in many ways. By extending such capabilities as reach (the availability of access or connections), depth (the richness or amount of detail communicated), and the aggregation of large volumes of data in an efficient manner, information technology enables many of the KM systems which in turn support KM processes (Becerra-Fernandez et al., 2004; Draft & Lengel, 1986; Evans & Wurster, 1999).

As a key component of the KM infrastructure, common knowledge supports knowledge transfer and sharing within the organization. According to Dixon (2000):

Like many English words, share has two meanings; it means to give away a part, which is an act of generosity, and it means to hold in common, as in a 'shared belief system.' These seemingly different meanings merge in the context of knowledge management. If I share my knowledge, that is, give it away, then we can both hold it in common—common knowledge that is known throughout the organization (p. 9).

Similarly, Davenport and Prusak (1998) state "A major factor in the success of any knowledge transfer project is the common language of the participants" (p. 98). Additionally, the value of knowledge held by experts in the organization can be enhanced and leveraged by integrating it with the knowledge of others into common knowledge (Becerra-Fernandez et al., 2004).

The last component of the KM infrastructure is the physical environment. Becerra-Fernandez et al. (2004) state that key aspects of this component "include the design of buildings

and the separation between them; the location, size, and type of offices; the type, number, and nature of meeting rooms…. Physical environment can foster KM by providing opportunities for employees to meet and share ideas" (p. 45). The lack of a physical environment in the context of temporary virtual teams presents challenges to their effectiveness. As explained earlier, the ambiguity encountered by team members as a result of the reliance on information and communications technologies in lieu of face-to-face communications creates barriers to the effectiveness of virtual teams (Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000; Ocker & Fjermestad, 2008).

Knowledge Sharing Systems

When organizations fail to effectively implement mechanisms and technologies for the organization and exchange of documents or allow the proliferation of disparate information sources, they fail to take advantage of and are at risk of losing their explicit organizational knowledge assets. Moreover, the loss of the tacit organizational knowledge held in the minds of the employees of the organization may be lost when those employees retire or leave the organization (Becerra-Fernandez et al., 2004). Recognizing the costs of losing either tacit or explicit organizational knowledge, organizations have become more committed to retaining their knowledge assets, or organizational memory through the use of knowledge sharing systems. As stated by Dixon (2000), "Perhaps organizations are now addressing the issue of knowledge sharing due to their growing awareness of the importance of knowledge to organizational success or perhaps because technology has made the sharing of knowledge more feasible" (p. 2). While systems for knowledge discovery, capture, sharing, and application are all needed for organizations to effectively manage their knowledge assets, the remainder of this review of literature will concentrate on the importance and characteristics of knowledge sharing systems.

According to Becerra-Fernandez et al. (2004), "Knowledge sharing systems can be described as systems that enable members of an organization to acquire tacit and explicit knowledge from each other" (p. 301). When organizations make a commitment to knowledge sharing systems, they are not only promoting the sharing and reuse of organizational knowledge assets, but they are helping to facilitate a culture of organizational learning as well (Becerra-Fernandez et al., 2004). The value of establishing an organizational culture based on learning and the sharing of knowledge is difficult to quantify, but should not be underestimated if knowledge sharing systems are to be effectively utilized. As stated by Davenport and Prusak (1998), "Extensive knowledge transfer could not happen in large global companies without the tools provided by information technology, but the values, norms, and behaviors that make up a company's culture are the principal determinants of how successfully important knowledge is transferred" (p. 96).

Knowledge Sharing System Design

Many factors are important to consider in the design of knowledge sharing systems. In their analysis of technological support for knowledge management and sharing in industrial practice, Kuhn and Abecker (1997) describe and define the concept of Corporate or Organizational Memory as, "a comprehensive computer system which captures a company's accumulated know-how and other knowledge assets and makes them available to enhance the efficiency and effectiveness of knowledge-intensive work processes" (p. 929). Based on their studies of Corporate Memories for supporting various aspects in the product life-cycles of three European corporations, Kuhn and Abecker (1997) identify the following requirements as crucial for the success of organizational memory information system projects in industrial practice:

1. Collection and systematic organization of information from various sources.

2. Integration into existing work environment.

3. Minimization of up-front knowledge engineering.

4. Active presentation of relevant information.

5. Exploiting user feedback for maintenance and evolution.

(p. 942).

Knowledge Sharing System Types

According to Becerra-Fernandez et al. (2004), "Knowledge sharing systems are classified according to their attributes. These specific types of knowledge sharing systems include:

1. Incident report databases.

2. Alert systems.

3. Best practices databases.

4. Lesson-learned (LL) systems.

5. Expertise-locator (EL) systems"

(p. 305).

Incident report databases are utilized to describe and disseminate information regarding unsuccessful experiences as well as incidents or malfunctions, such as software bug reports. Generally, incident reports list arguments that explain the incident without posing recommendations (Becerra-Fernandez et al., 2004; Weber, Aha, & Becerra-Fernandez, 2001).

According to Weber et al. (2001), Alert systems "manage repositories of alerts that are organized by a set of related organizations that share the same technology and suppliers. Some organizations use the same communication process to disseminate both lessons and alerts, which can be used as sources for creating lessons" (p. 19).

As opposed to incident report and alert systems, best practices databases describe successful efforts. These are descriptions of previously successful ideas that are applicable to organizational processes (Becerra-Fernandez et al., 2004; Weber et al., 2001). Essentially, best practices describe the best way to perform some activity. According to O'Leary (1999), "Reengineering has led to permanent changes in our knowledge of how to perform some business processes more efficiently. As a result, as generic processes become reengineered, best practices begin to emerge. These best practices then are adapted by competitors so that they can remain competitive" (p. 19).

According to Weber et al. (2001), the goal of a lessons learned (LL) system is "to capture and provide lessons that can benefit employees who encounter situations that closely resemble a previous experience in a similar situation" (p. 18). The essential tasks of LL systems in support of organizational processes are to collect lessons, verify the lessons for correctness, store the lesson through indexing, formatting, and incorporation into a repository, disseminate the lesson in order to promote its reuse, and finally, reuse or apply the lesson (Weber et al., 2001). With LL systems, individuals can benefit from the knowledge acquired by others. Individuals can articulate their tacit knowledge acquired through the performance of certain tasks into a more explicit format which can be more easily shared with and reused by others.

The four knowledge sharing systems described above represent commonly used types of knowledge repositories. Their functionality is summarized in Table 3.

Table 3.

Types of Knowledge Repositories

Knowledge-Sharing System	Originates from Experiences?	Describes a Complete Process?	Describes Failures?	Describes Successes?	Orientation
Incident reports	Yes	No	Yes	No	Organization
Alerts	Yes	No	Yes	No	Industry
Lessons Learned System	Yes	No	Yes	Yes	Organization
Best Practices Databases	Possibly	Yes	No	Yes	Industry

(Weber et al., 2001, p. 19)

The intent of Expertise-locator (EL) knowledge sharing systems is to catalog knowledge competencies, including information not typically captured by human resources systems, in a way that is accessible across the organization (Becerra-Fernandez et al., 2004). Unlike the four types of knowledge sharing systems described previously, EL systems, also referred to as yellow pages or knowledge maps, constitute a guide to knowledge rather than a repository containing it. As stated by Davenport and Prusak (1998), "Developing a knowledge map involves locating important knowledge in the organization and then publishing some sort of list or picture that shows where to find it. Knowledge maps typically point to people as well as to documents and databases" (p. 72).

Because tacit knowledge is so complex and internalized by the knower, it is difficult to accurately articulate and codify in a repository. This is why in many cases; the best way to enable the sharing of tacit knowledge is to facilitate the finding of individuals who possess the desired knowledge (Davenport and Prusak, 1998). While EL systems are generally intended to perform the same purpose, they are often implemented in different ways. According to Becerra-Fernandez et al. (2004), characteristics including the purpose of the system, the access method to

the information in the system, the methods for assessing the knowledge resources, the level of

participation within the organization, the knowledge taxonomy used to classify the knowledge

resources, as well as the levels of competencies of the knowledge resources identified by the EL

system are factors which differentiate different EL system implementations.

Chapter 3 – Research Methodology

Background

The researcher had initially planned to utilize an action research methodology to accomplish the goals of this research. With its many qualitative measures, it was felt that an action research methodology would enable the collection and analysis of rich descriptive data in a research area heavily dependent upon both social and technical factors. However, after conducting a more thorough evaluation of action research, the researcher came to the conclusion that the research area chosen for this research as well as the researcher's involvement in that area did not present the necessary environment for effective action research.

Action research involves the important elements of planning and implementing action in addition to the observation of, and reflection on the results of that action. In order to effect successful action research, these elements may need to be performed many times as a spiral of planning, acting, observation, and reflection before the desired result or outcome is achieved (Kemmis & McTaggart, 1988).

The researcher felt that two characteristics of the research area would hinder the action research process. First of all, while the goals of this research involve the examination and exploration of the effectiveness of certain actions and methods intended to promote an effective progression of virtual teams over time, these actions were to a great degree planned and implemented by participants other than the researcher. Secondly, with a goal of evaluating the practical methodologies that support the development of an internal structure to support knowledge sharing between temporary virtual teams, the researcher concluded that there wasn't enough time available to complete the multiple iterations of the spiral of planning, action, observation, and reflection needed for effective action research.

Overview

Single case study research was utilized as the research methodology for this study. As a well established research methodology, case study research provides the advantages of many qualitative research measures similar to action research, but without the added dimensions of the researcher being responsible for actions taken and without the need for a greater period of time to conduct the research. Yin (2003) defines the case study research method as an "empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). Utilized by researchers for many years in a variety of disciplines, case study research emphasizes a descriptive contextual analysis of a limited number of events or conditions and their relationships. As a qualitative research method, case study research has been widely used to examine contemporary real-life situations (Soy, 1997; Yin, 2003). Often, the goal of case study research is to progress toward a holistic understanding of cultural systems of action (Feagin, Orum, & Sjoberg, 1991).

A review of literature in the areas of virtual teams and knowledge sharing was conducted in order to better understand the research area. This review of literature also provided the researcher with needed insight for the selection of a research methodology. While the need for and use of technology to more effectively share knowledge is well documented, the literature also suggests that the tendency by many to view technology as an end all diminishes the needed emphasis on and development of the softer more social aspects of virtual teams (Davenport & Prusak, 1994; Dixon, 2000). Similarly, the researcher's desire to incorporate the contextual social and personal perspectives of the participants involved in the research area into this study provided further incentive for the researcher to select the case study research methodology.

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Case Study Research Framework

Based on the works of well know case study researchers Robert E. Stake, Helen Simons, and Robert K. Yin, Soy (1998) proposes that the following six steps can be used to effectively organize and conduct case study research:

1. Determine and define the research questions

2. Select the cases and determine data gathering techniques

3. Prepare to collect the data

4. Collect data in the field

5. Evaluate and analyze the data

6. Prepare the report

These six steps were utilized as a framework for the remainder of this research.

Determine and define the research questions

The determination and definition of the research questions was important in order to provide focus and direction to the remainder of the research. The goal of this research was to evaluate the practical methodologies that support the development of an internal structure to support knowledge sharing between temporary virtual teams. With this goal in mind, the research questions were formulated in a manner intended to facilitate the correlation of the data derived from the review of literature with the data collected in the research area.

Several important themes and theories relevant to effective temporary virtual teams and their knowledge sharing activities became evident in the review of literature. These themes and theories provided the basis for theoretical propositions and are evident in the following research questions:

1. How can temporary virtual teams overcome the challenges presented by their reliance on communication and information technologies, and the lack of face-to-face communications in their temporally and spatially dispersed work environments?

2. How important are knowledge sharing activities to temporary virtual teams and how may they be useful?

3. What currently used knowledge sharing activities are the most effective? Why?

4. What additional knowledge sharing activities would be beneficial to future temporary virtual teams? Why?

Select the cases and determine data gathering techniques

The case studied for this research was a graduate level global database and information systems practicum which was generally referred to as the database practicum. Initially started in early 2000, a major focus of the database practicum is to expose students to the skills required of a 21st Century Knowledge Worker.

With an emphasis on the areas of knowledge management, learning organizations, virtual teams, and remote administration, the database practicum offers a unique opportunity to students who desire to learn more about these topics. Another major focus of the database practicum is to provide services to students participating in database related coursework. The students participating in the database practicum, in addition to the faculty members who oversee and manage the program, are responsible for all aspects of the installation, service, and support of databases and database related products utilized in this academic environment. Students participating in the database practicum make a six month commitment to provide and support these services. With two database practicums per annum, they are organized as an A and a B database practicum. The A database practicum operates from January till June, and the B

database practicum operates from July till December. For the purposes of this research, the 2008B practicum was referred to as the database practicum, and was effectively the unit of analysis of this research.

An important consideration in this case is that from the initiation of the first database practicum to its current implementation, the faculty member primarily responsible for the creation and management of the database practicum left the university with little notice. Unfortunately, much of the knowledge necessary to the operations of the database practicum was lost with the departure of this faculty member. As a result of this event, a new team of faculty was created to manage the database practicum. Recognizing the loss of valuable operational knowledge, the new faculty team emphasized the areas of knowledge and change management as essential to preventing a future loss of operational knowledge. As a student participating in the 2008B database practicum, the researcher gathered data from the case in the form of participant observation, interviews of the faculty team, a survey of the student participants, and a document analysis.

Prepare to collect the data

In preparation for data collection, a case study database was created. As a repository of evidence collected in the research area, the case study database was capable of storing and organizing a variety of data collected from multiple data sources. The interview and survey data collection techniques utilized in this research reflected the virtuality of the database practicum as they were implemented in a web-based format rather than in a face-to-face environment.

Collect data in the field

As the researcher was an active participant in the database practicum, participant observation was employed as a data collection method. Mindful of the potential for bias

attributed to this method of data collection, the researcher believed participant observation would provide greater insight into the interpersonal behaviors and motives of the database practicum's participants and faculty team. Additionally, participant observation allowed the researcher to experience first hand the methodologies utilized by the database practicum to achieve its goals.

The faculty team and student participants of the database practicum were contacted by the researcher to encourage their participation in this case study. Data was collected from the faculty team and student participants with interview and survey data collection techniques. With interviews and surveys, the intent of the researcher was to gather targeted data focused largely by the theoretical propositions of this study and the review of literature which provided their basis.

The database practicum faculty team was asked to answer the six open-ended questions listed below:

Faculty team interview questions:

1. How does the lack of face-to-face communications in the database practicum environment affect the levels of trust and shared understanding among participants?

2. How do you foster trust and shared understanding among the participants of the database practicum?

3. How would you describe the communication behaviors and participant actions of effective participants in the database practicum?

4. How important are knowledge sharing activities to temporary virtual teams such as the database practicum?

5. What knowledge sharing systems or activities currently in use by the database practicum are the most effective? Why?

6. What additional knowledge sharing systems or activities would be beneficial to current or future database practicums? Why?

Appendix B contains a sample faculty team interview.

The student participants of the database practicum were asked to complete a likert scale survey with the following five-level likert item format:

1. Strongly disagree

2. Disagree

3. Neither agree nor disagree

4. Agree

5. Strongly Agree

This survey required the database practicum student participants to evaluate and respond to the following twenty five likert item statements:

Student participant survey statements:

1. Effective knowledge sharing systems, mechanisms, and technologies are important to share knowledge with future database practicums.

2. Actions of participants that reflect the ability to cope with technical and task uncertainty build trust within the database practicum environment

3. Predictable communication behavior is important for building trust in the database practicum.

4. The ability to reference a best practices database would enhance the level of knowledge sharing in the database practicum.

5. Actions of participants that display rational, disciplined behavior in reaction to crisis build trust in the database practicum.

6. The database practicum faculty team has made knowledge management processes such as knowledge sharing a priority.

7. The lack of face-to-face communications reduces the level of knowledge sharing in the database practicum.

8. The database practicum is fully utilizing knowledge sharing systems for the sharing of both implicit and explicit knowledge with future database practicums.

9. Incident reporting systems like TrackIt are important for knowledge sharing in the database practicum.

10. The communication and information technology utilized in the database practicum environment promotes a high-level of trust and shared understanding between its participants.

11. Positive leadership activities can promote a higher-level of trust and shared understanding in the database practicum environment.

12. The database practicum would benefit from the implementation of a knowledge map or expertise locator system.

13. Substantive and timely responses to requests are communication behaviors important to build trust in the database practicum.

14. A lessons learned system would be a valuable knowledge sharing tool for the database practicum.

15. Team building activities, designed with temporary virtual teams like the database practicum in mind, would provide a more fulfilling and productive environment.

16. The sharing of more tacit knowledge could be accomplished if the start and end time of multiple database practicums overlapped allowing for direct interaction between the participants of multiple database practicums.

17. The knowledge sharing systems used by the database practicum were reliable and available.

18. Communication conveying enthusiasm is an important factor for facilitating trust in the database practicum.

19. The database practicum needs to incorporate the use of more video technology to better share knowledge.

20. The exchange of social information between database practicum participants is an important facilitator for building trust.

21. The database practicum needs to make greater use of knowledge sharing systems, mechanisms, and technologies.

22. Communication behavior has a strong influence on the effectiveness of the database practicum's participants.

23. The database practicum would be a more fulfilling and productive environment if the participants were able to meet face-to-face on a regular basis.

24. When participants take action and show a high level of individual initiative they are facilitating trust with others in the database practicum.

25. The faculty team has incorporated many enabling conditions to enhance the effectiveness of the database practicum environment.

26. The use of SharePoint by the database practicum provides an effective, available repository in support of knowledge sharing activities.

Appendix A contains an example student participant survey.

The mechanism for administering both the faculty team interview and the student participant survey was developed by the researcher using web-based forms. Prior to the administration of the interview and survey processes, all interview questions and survey statements were submitted to the Regis University IRB Board for approval. Appendix C contains a copy of the approval letter.

An analysis of the documentation available to the database practicum was also used as a data collection technique. Documentation as a data or evidence source provided access to stable, unobtrusive, exact, and broadly covered information and explicit knowledge. According to Yin (2003), the "most important use of documents is to corroborate and augment evidence from other sources" (p. 87). The data collected from the documentation analysis in addition to the data collected from the participant observation, faculty interviews, and participant survey were added to the case study database. The case study database was essential for managing and allowing access to the data collected. It was used extensively in the next step of this case study, the evaluation and examination of the data.

Evaluate and analyze the data

A reliance on theoretical propositions guided the researcher in the analysis of the collected data. Specifically, the proposition that an internal structure to support knowledge sharing is necessary for temporary virtual teams to progress over time, which guided the review of literature and the formulation of research questions, and the data collection techniques was also utilized to guide the data analysis. This reliance added focus to the analysis of the multiple sources of data or evidence gathered in a manner intended to facilitate the correlation of the data derived from the review of literature with the data collected in the research area.

Prepare the report

Reporting the case study was the final step in this case study research framework and according to Yin (2003), "Reporting a case study means bringing its results and findings to closure" (p.141). With the intent to make connections between the results and findings of this case study with the theories and findings of previous research or studies, the author presented this case study report as a series of questions and answers. This reporting format, guided once again by the theoretical propositions allowed the researcher to directly answer the research questions. These results are included in Chapter 4 – Data Analysis and Results.

Chapter 4 – Data Analysis and Results

Overview

The goal of this research was to evaluate the practical methodologies that support the development of an internal structure to support knowledge sharing between temporary virtual teams. This goal led the researcher to identify a key theoretical proposition as an important guiding principle that provided the foundation for this study. The proposition that an internal structure to support knowledge sharing is necessary for temporary virtual teams to progress over time, guided the review of literature as well as the design of this case study research. This proposition, which provided focus in the development and implementation of research questions, case selection, and data collection, also guided the analysis and reporting of the collected data.

Multiple sources of data or evidence were incorporated within the framework of this study to provide for an analysis based on a convergence of that data. Data was collected through a review of literature, document analysis, participant observation, an interview of the database practicum faculty team, and a survey of the student participants of the database practicum. The interview of the database practicum faculty team was intended to gain a greater understanding of the thoughts and ideals of the individuals responsible for the design of the database practicum and the survey of the student participants of the database practicum was intended to gain the same from those responsible for the operations of the database practicum.

Analysis and Results

In order to facilitate more direct answers to the research questions and to provide for more specific access to this study's results, the analysis was structured around the following research questions:

1. How can temporary virtual teams overcome the challenges presented by their reliance on communication and information technologies, and the lack of face-to-face communications in their temporally and spatially dispersed work environments?

2. How important are knowledge sharing activities to temporary virtual teams and how may they be useful?

3. What currently used knowledge sharing activities are the most effective? Why?

4. What additional knowledge sharing activities would be beneficial to future temporary virtual teams? Why?

Research Question 1

The database practicum was designed to function like a small information technology company. Figure 4 presents the organizational structure of the 2008B database practicum.
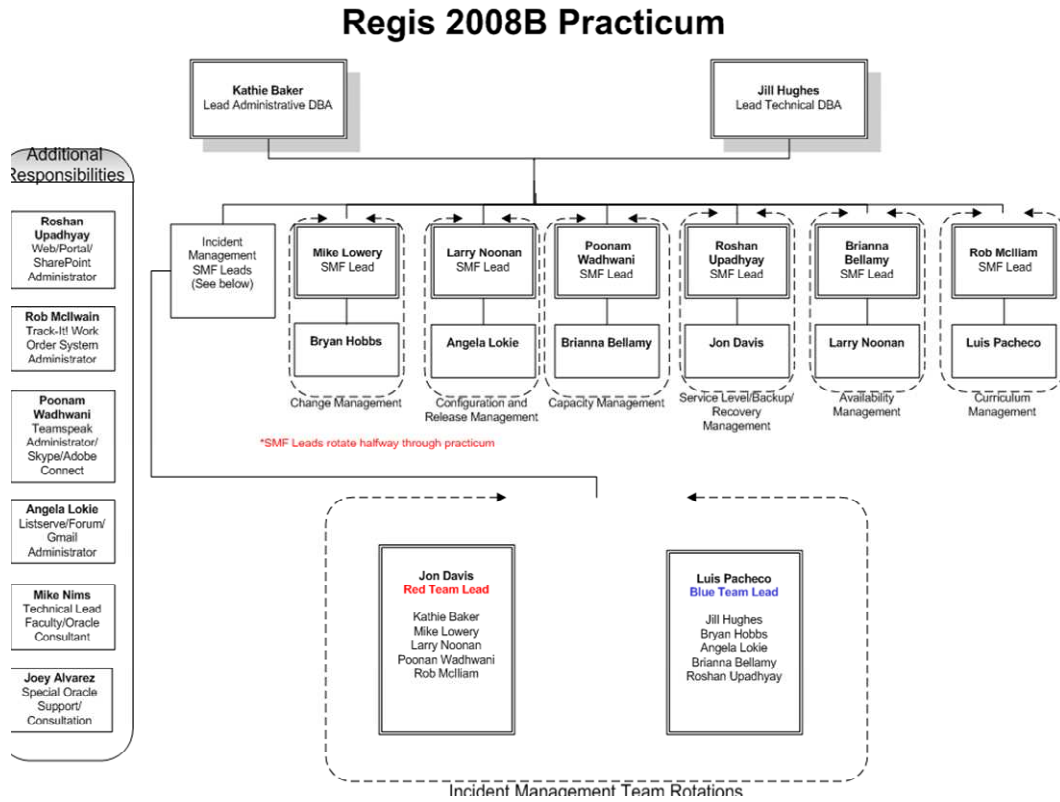

Figure 4. Regis 2008B Database Practicum Organizational Structure.

The organizational chart for the database practicum provided clear definition of the roles and responsibilities of both the student participants and the faculty team. This organizational chart was retrieved from the SharePoint browser-based collaboration and document-management system utilized by the database practicum. SharePoint served as the primary storage for all documentation related to the database practicum. When asked to respond to the survey statement "The use of SharePoint by the database practicum provides an effective, available repository in support of knowledge sharing activities", 50% of the student participant survey responses agreed. The remaining 50% neither agreed nor disagreed.

26. The use of SharePoint by the database practicum provides an effective, available repository in support of knowledge sharing activities.		Response Percent	Response Count
Strongly Disagree		0.0%	0
Disagree		0.0%	0
Neither Agree nor Disagree		50.0%	5
Agree		30.0%	3
Strongly Agree		20.0%	2
		answered question	10
		skipped question	0

Monthly meetings were held by the database practicum participants to discuss both operational and educational issues. These monthly meetings were initially conducted using Skype teleconferencing, but after experiencing technical difficulties with this medium, telephone conferencing was used instead. A web component was also utilized during these meetings in order to share content such as power point presentations and word documents in real time with the telephone based teleconference. Additionally, the monthly meetings were recorded and made available for download through SharePoint for later review as audio files. Figure 5 shows an example monthly agenda.

2008B DBA
Practicum Monthly
Meeting – August 08

8am – 10am MTN
U.S. & Canada: 800.747.5150
Access Code: 8875391
https://www.callinfo.com/prt?ac=8875391&an=8007475150&host=globalcrossing

Facilitator: Kathie Baker **Note taker:** Kathie Baker

Attendees:

☐ Kathie Baker	☐ Jill Hughes	☐ Rob McIlwain	☐ Charles Thies
☐ Brianna Bellamy	☐ Bryan Hobbs	☐ Mike Nims	☐ Poonam Wadhwani
☐ Jon Davis	☐ Angela Lokie	☐ Larry Noonan	
☐ Denise Duncan	☐ Mike Lowry	☐ Louis Pacheco	

AGENDA ITEMS

Topic	Presenter	Time allotted
✓ Welcome	Denise	2.5 min
✓ Roll Call	Kathie	2.5 min
✓ Technical Operations Update	Mike N.	10 min
✓ Fall 8W1 & 8W2 Course Setup Plan Overview	Jill	10 min
✓ Incident Management Update	Jon	5 min
✓ Backup & Recovery SMF Team Current Tasking and Goals	Jon/Jill	5 min
✓ Change Management SMF Team Status	Mike L.	5 min
✓ Config & Release SMF Team Status	Larry	5 min
✓ MS SQL Server Implementation Update – Schedule & Resources	Angela	5 min
✓ Capacity SMF Team Status	Poonam	5 min
✓ Availability SMF Team Current Tasking and Goals	Brianna	5 min
✓ Curriculum SMF Team Current Tasking and Goals	Rob	5 min
✓ Thesis Idea Papers and Proposals	Charlie	10 min
✓ Questions	All	10 min
✓ Review Action Items/Next Meeting	Kathie	5 min

Next 2008B DBA Practicum Monthly Meeting: Saturday, Sept 19, 2008 8am – 10am MTN

Figure 5. Example Regis 2008B Database Practicum Monthly Agenda.

The database practicum environment was a highly virtual environment, where the participants were dispersed both spatially and temporally. For the researcher, all interaction and communication within this virtual team was conducted utilizing communication and information technology. At one point early in the database practicum, participants local to Regis University were able to meet each other, however, this opportunity occurred only once, and was not available to all of the database practicum participants.
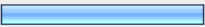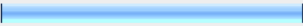
The literature suggests that the correlation between the virtuality of a team and the challenges, complexity, and barriers to effectiveness which it may encounter is high (Gibson &

Cohen, 2003; Jarvenpaa & Leidner, 1998; Powell, Piccoli & Ives, 2004). Furthermore, the literature strongly suggests that mutual trust is necessary for virtual teams to be effective (Gibson & Cohen, 2003; Hinds & Weisband, 2003; Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000; Ocker & Fjermestad, 2008). With this in mind, the student participants of the database practicum were asked to respond to survey statements Q2, Q3, Q5, Q11, Q13, Q18, Q20, and Q24 in order to gauge how effectively they felt that certain actions and communications behaviors were in building trust in the database practicum environment.

The results of one half of these survey questions, specifically Q2, Q5, Q11, and Q13 indicated 100% agreement with the survey statement.

2. Actions of participants that reflect the ability to cope with technical and task uncertainty build trust within the database practicum environment.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	0.0%	0
Agree	90.0%	9
Strongly Agree	10.0%	1
answered question		10
skipped question		0

5. Actions of participants that display rational, disciplined behavior in reaction to crisis build trust in the database practicum.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	0.0%	0
Agree	50.0%	5
Strongly Agree	50.0%	5
answered question		10
skipped question		0

49

11. Positive leadership activities can promote a higher-level of trust and shared understanding in the database practicum environment.
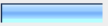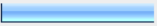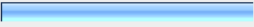
	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	0.0%	0
Agree	40.0%	4
Strongly Agree	60.0%	6
answered question		10
skipped question		0

13. Substantive and timely responses to requests are communication behaviors important to build trust in the database practicum.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	0.0%	0
Agree	50.0%	5
Strongly Agree	50.0%	5
answered question		10
skipped question		0

Questions Q3, Q18, and Q24 indicated at least 80% agreement.

3. Predictable communication behavior is important for building trust in the database practicum.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	20.0%	2
Agree	30.0%	3
Strongly Agree	50.0%	5
answered question		10
skipped question		0

18. Communication conveying enthusiasm is an important factor for facilitating trust in the database practicum.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	20.0%	2
Agree	50.0%	5
Strongly Agree	30.0%	3
answered question		10
skipped question		0

24. When participants take action and show a high level of individual initiative they are facilitating trust with others in the database practicum.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	10.0%	1
Agree	40.0%	4
Strongly Agree	50.0%	5
answered question		10
skipped question		0

While question Q20 indicated the only disagreement in this group at 10%, 50% of responses were in agreement with the survey statement.

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20. The exchange of social information between database practicum participants is an important facilitator for building trust.		Response Percent	Response Count
Strongly Disagree		0.0%	0
Disagree		10.0%	1
Neither Agree nor Disagree		40.0%	4
Agree		40.0%	4
Strongly Agree		10.0%	1
		answered question	10
		skipped question	0
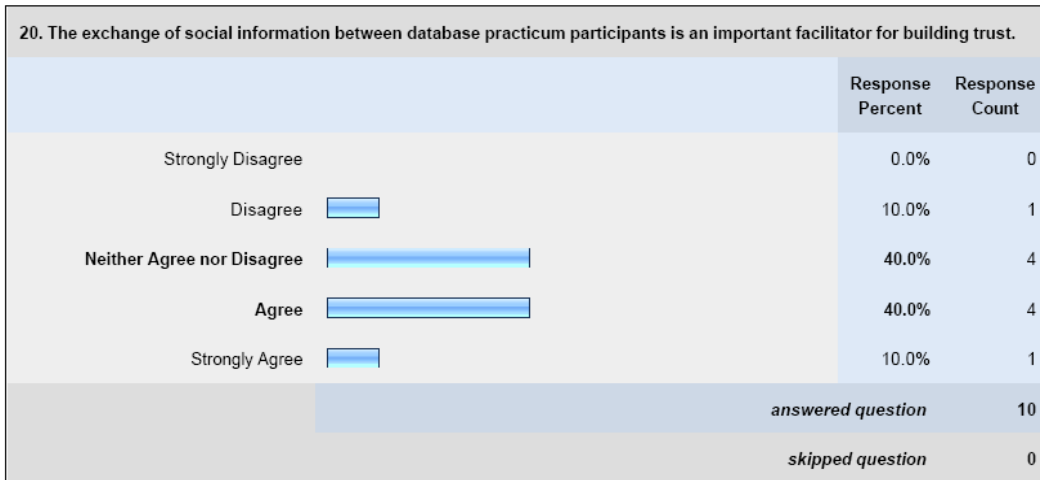
These results indicated that the student participants of the database practicum responded with a high degree of agreement to the following survey statements related to actions and trust:

- Actions of participants that reflect the ability to cope with technical and task uncertainty build trust within the database practicum environment.

- Actions of participants that display rational, disciplined behavior in reaction to crisis build trust in the database practicum.

- Positive leadership activities can promote a higher-level of trust and shared understanding in the database practicum environment.

- When participants take action and show a high level of individual initiative they are facilitating trust with others in the database practicum.

Additionally, these results showed that the student participants of the database practicum responded with a high degree of agreement to the following survey statements related to communication behaviors and trust:

- Predictable communication behavior is important for building trust in the database practicum.

- Substantive and timely responses to requests are communication behaviors important to build trust in the database practicum.

- Communication conveying enthusiasm is an important factor for facilitating trust in the database practicum.

- The exchange of social information between database practicum participants is an important facilitator for building trust.

These survey results were highly supportive of the results of previous research about trust and virtual teams. Based on a series of case studies of global virtual teams, Jarvenpaa and Leidner (1998) categorized the characteristics of communication behaviors and team member actions that appeared to facilitate the existence of trust in virtual teams. A summary of these characteristics is presented in Table 4 and more details of this study are provided in the review of literature.

Table 4.

Trust Facilitating Communication Behaviors and Member Actions

Communication Behaviors Facilitating Trust Early On	Member Actions Facilitating Trust Early On	Communication Behaviors Maintaining Trust Later on	Member Actions Facilitating Trust Later On
Social Communication	Coping with Technical and Task Uncertainty	Predictable Communication	Leadership
Communication Conveying Enthusiasm	Individual Initiative	Substantive and Timely Response	Transition from Procedural to Task Focus
			Phlegmatic Reaction to Crisis

(Jarvenpaa and Leidner, 1998, Table 5).

The response to survey statement Q22 resulted in 100% agreement with the survey statement. This indicated strong support for the idea that communication behavior has a strong influence on the effectiveness of the database practicum's participants.

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22. Communication behavior has a strong influence on the effectiveness of the database practicum's participants.		
	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	0.0%	0
Agree	50.0%	5
Strongly Agree	50.0%	5
answered question		10
skipped question		0
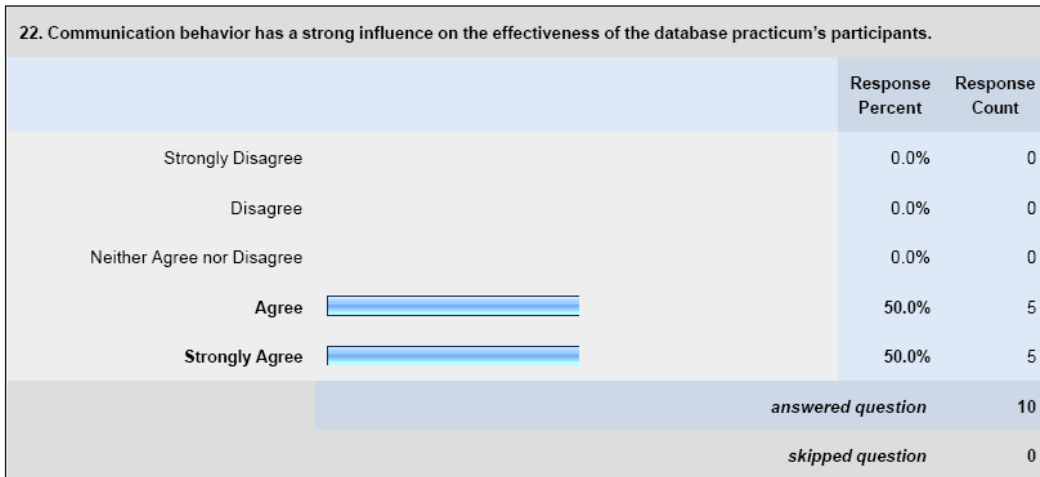
Survey statement Q10 was intended to provide an indication of the database practicum participant's opinions about the effectiveness of the communication and information technology in use by the database practicum. While 50% agreed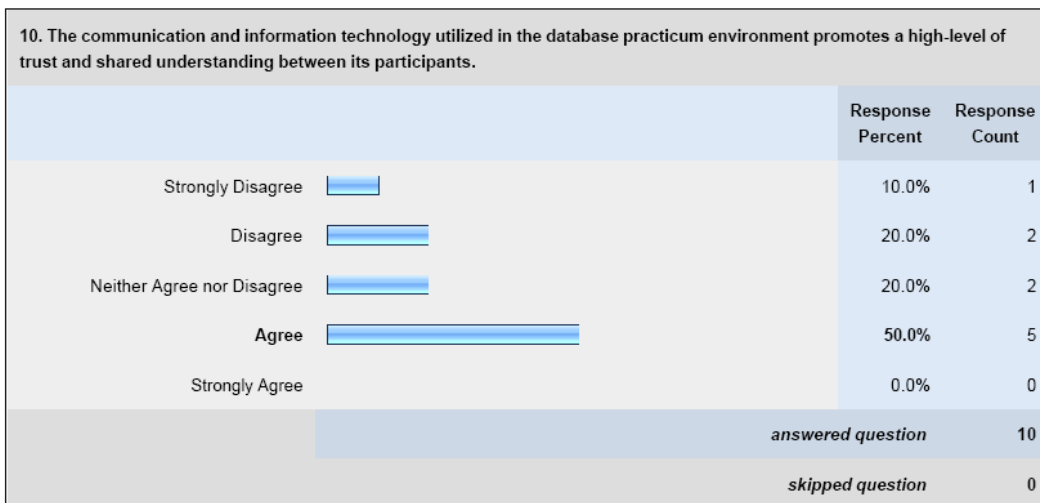 that the communication and information technologies in use promoted a high-level of trust and shared understanding, 30% disagreed, and 20% were undecided.

10. The communication and information technology utilized in the database practicum environment promotes a high-level of trust and shared understanding between its participants.		
	Response Percent	Response Count
Strongly Disagree	10.0%	1
Disagree	20.0%	2
Neither Agree nor Disagree	20.0%	2
Agree	50.0%	5
Strongly Agree	0.0%	0
answered question		10
skipped question		0

When asked how they would describe the communication behaviors and participant actions of effective participants in the database practicum, the responses from the faculty team indicated that a reliance on email was adequate, and that a lack of organization hindered the

communication process. One response indicated that the most successful participants took action by seeking feedback, and also utilized the existing technology in use by the database practicum to its fullest. Moreover, the use of Skype video conferencing technology was touted as a particularly effective communication behavior.
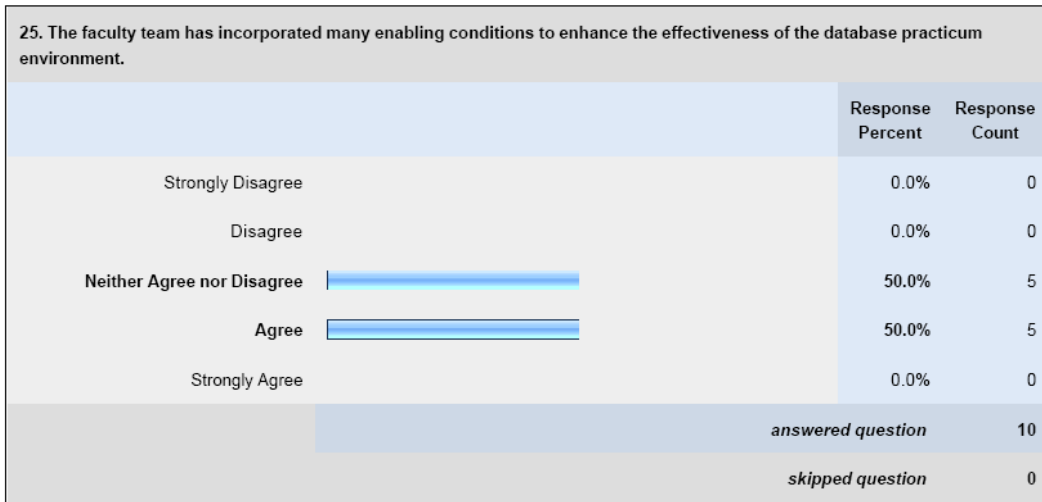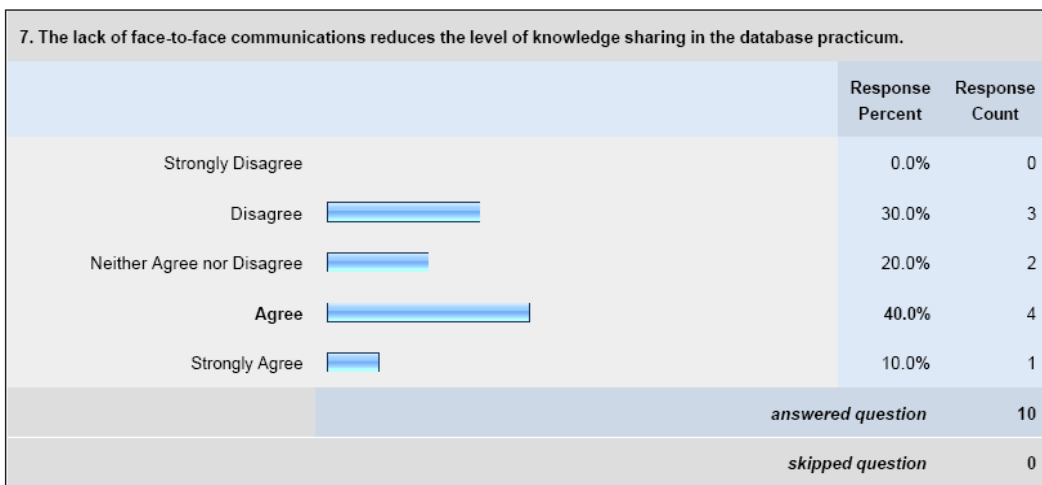
The literature suggests that leaders and managers facilitate trust and are more successful when they are able to keep team members on task by creating awareness about team members' progress. Managers can increase team identity and trust by ensuring that the team members understand and believe in the team's goals (Hinds & Weisband, 2003). According to Gignac (2004), "facilitation strategies must be carefully planned and deployed so that the attitude of 'one for all and all for one' is able to emerge and collaboration can truly occur. Indeed, collaboration cannot be forced on people. It can only be facilitated" (p. 183). Survey statement Q15 was devised to determine if the database practicum's participants believed that team building activities would have a positive effect as suggested by the literature. With 90% of the responses in agreement with the survey statement, there was a strong indication that the participants of the database practicum agreed that efforts by leaders and managers in team building activities are important and can have a positive effect.

15. Team building activities, designed with temporary virtual teams like the database practicum in mind, would provide a more fulfilling and productive environment.	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	10.0%	1
Agree	80.0%	8
Strongly Agree	10.0%	1
answered question		10
skipped question		0

55
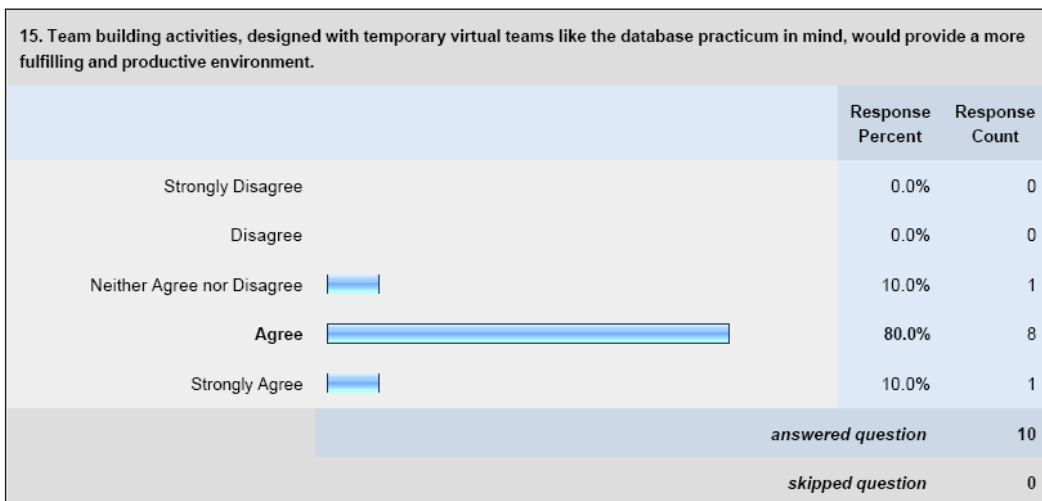
Additionally, survey statement Q25 was intended to reveal whether the database practicum participants felt that the faculty team had incorporated necessary enabling conditions to enhance the effectiveness of the database practicum environment. The 50% agreement to this survey statement did not indicate a high level of agreement.

25. The faculty team has incorporated many enabling conditions to enhance the effectiveness of the database practicum environment.	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	50.0%	5
Agree	50.0%	5
Strongly Agree	0.0%	0
answered question		10
skipped question		0

Survey statements Q7 and Q23 were created in order to gauge how the database practicum participants felt about the lack of face-to-face communications in the practicum.

7. The lack of face-to-face communications reduces the level of knowledge sharing in the database practicum.	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	30.0%	3
Neither Agree nor Disagree	20.0%	2
Agree	40.0%	4
Strongly Agree	10.0%	1
answered question		10
skipped question		0

23. The database practicum would be a more fulfilling and productive environment if the participants were able to meet face-to-face on a regular basis.		
	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	20.0%	2
Neither Agree nor Disagree	50.0%	5
Agree	20.0%	2
Strongly Agree	10.0%	1
answered question		10
skipped question		0

Interestingly, while there was a 50% agreement with the survey statement that the lack of face-to-face communications reduces the level of knowledge sharing in the database practicum, only 30% agreed that the database practicum would be a more fulfilling and productive environment if the participants were able to meet face-to-face on a regular basis.

Similarly, the responses provided by the database practicum faculty team seemed to reflect the variance of responses of the student participants. When asked the question how does the lack of face-to-face communications in the database practicum environment affect the levels of trust and shared understanding among participants, the faculty's responses ranged from an indication that there is little impact to a response indicating that people like face-to-face communication, but when all parties understand that they are limited to verbal and written communications, then those methods are just as effective. There was also a response indicating that the lack of face-to-face communications is a challenge to building trust that can be overcome by strong leadership, an emphasis on frequent communications including video conferencing, and a system to reward those who actively share knowledge.

The faculty team also supported the proposition that communication is important for building trust with one response detailing the enhanced ability to build trust when the method of

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communications included Skype video conferencing. As a participating observer in the database practicum, the researcher also found that Skype video conferencing enabled a higher level of trust. The ability to see the facial expressions of a particular faculty team member when the discussion involved the progress of this researcher/student participant provided for more valuable feedback when compared to email or phone based communication.

Research Question 2

The literature suggests that when organizations fail to effectively implement mechanisms and technologies for the organization and exchange of documents, or allow the proliferation of disparate information sources, they fail to take advantage of and are at risk of losing their explicit organizational knowledge assets. Moreover, the loss of the tacit organizational knowledge held in the minds of the employees of the organization may be lost when those employees retire or leave the organization (Becerra-Fernandez et al., 2004).

According to Becerra-Fernandez et al. (2004), "Knowledge sharing systems can be described as systems that enable members of an organization to acquire tacit and explicit knowledge from each other" (p. 301). When organizations make a commitment to knowledge sharing systems, they are not only promoting the sharing and reuse of organizational knowledge assets, but they are helping to facilitate a culture of organizational learning as well (Becerra-Fernandez et al., 2004). Davenport and Prusak (1998), also recognize the value of knowledge sharing activities when they state, "Extensive knowledge transfer could not happen in large global companies without the tools provided by information technology, but the values, norms, and behaviors that make up a company's culture are the principal determinants of how successfully important knowledge is transferred" (p. 96).

Research has suggested that knowledge management activities enable the effectiveness of temporary virtual teams. This has been demonstrated in a study of communication differences between high and low performance temporary virtual teams conducted by Ocker and Fjermestad (2008). In this study, team members communicated and collaborated solely via asynchronous computer-mediated communication for a period of between fourteen and seventeen days. In their research, Ocker and Fjermestad (2008) found that high performance teams "incorporated two emergent structures pertaining to knowledge management to counter these drawbacks of asynchronous interaction: (1) reviewing the knowledge repository created as a result of their electronic communication, and (2) summarizing content" (Ocker & Fjermestad, 2008, p. 63).

The student participants of the database practicum agreed with the findings of the review of literature and previous research. This was evident in their 100% agreement with the survey statement "Effective knowledge sharing systems, mechanisms, and technologies are important to share knowledge with future database practicums".
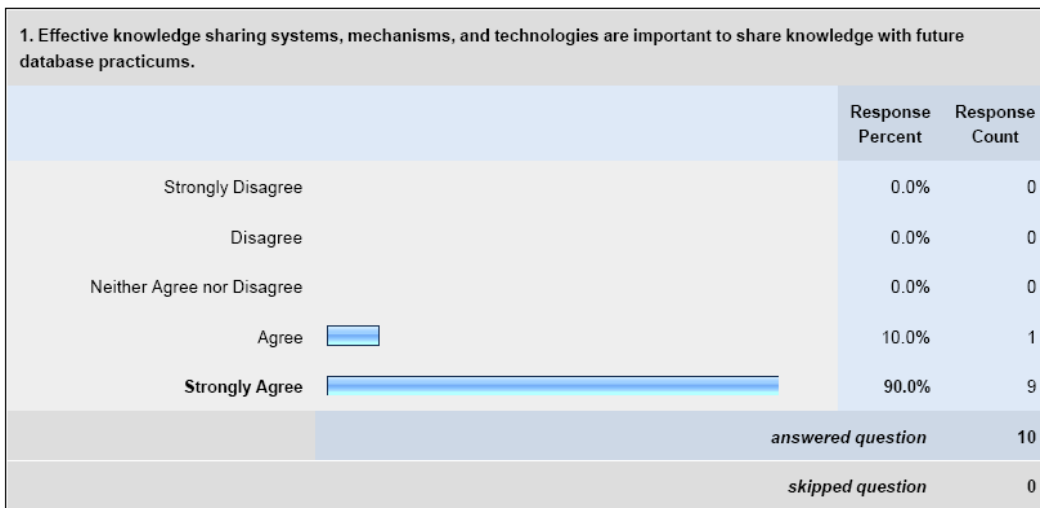
Similarly, when the faculty team members of the database practicum were asked the question "How important are knowledge sharing activities to temporary virtual teams such as the database practicum", their responses indicated that knowledge sharing activities are crucial and one

response stressed that the development of an effective knowledge sharing infrastructure is critical

to the continued success of the database practicum. This response also suggested that the time

frame of database practicums should provide some overlap in order to promote continuity

between practicums, and also to facilitate the sharing of tacit knowledge.

A review of documents in the SharePoint browser-based collaboration and document-

management system utilized by the database practicum also provided an indication of the

emphasis placed on sharing knowledge in the current and past database practicums. Figure 6 is a

screen shot of a listing of shared documents available to database practicum participants through
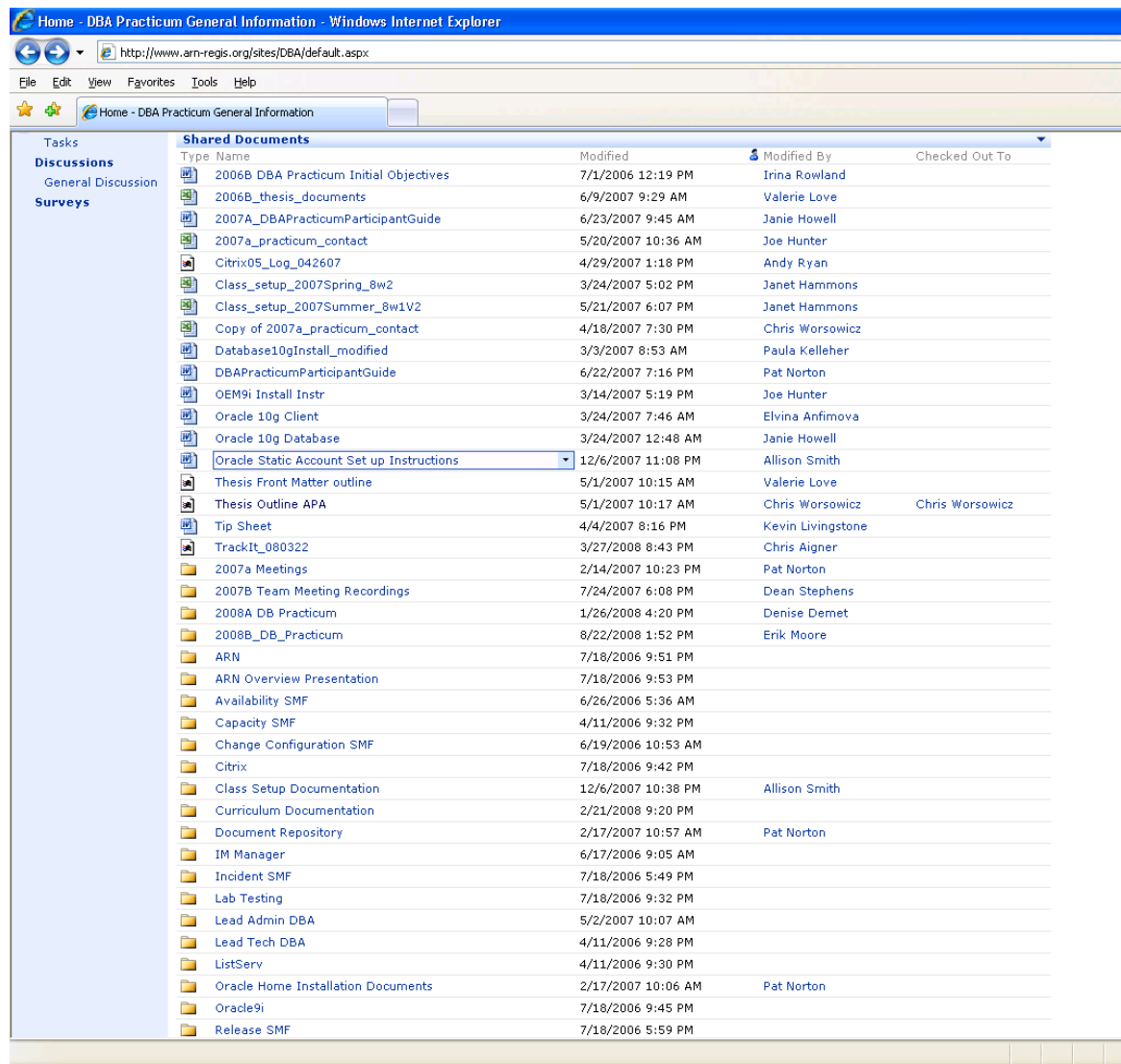
SharePoint.

Figure 6. Listing of Shared Documents in SharePoint.

The listing of shared documents in Figure 6 provided a strong indication that current and past

database practicums had made a significant effort to share explicit knowledge. Dating back to

2006, there were many documents in SharePoint covering a variety of topics including

organizational, technical, administrative, problem solving, and educational issues. In reviewing

the SharePoint shared documents, it appeared to this researcher that there was a greater emphasis

on sharing knowledge within individual database practicums and less of an emphasis on sharing

knowledge between database practicums. Figure 7 illustrates the structured organization of the

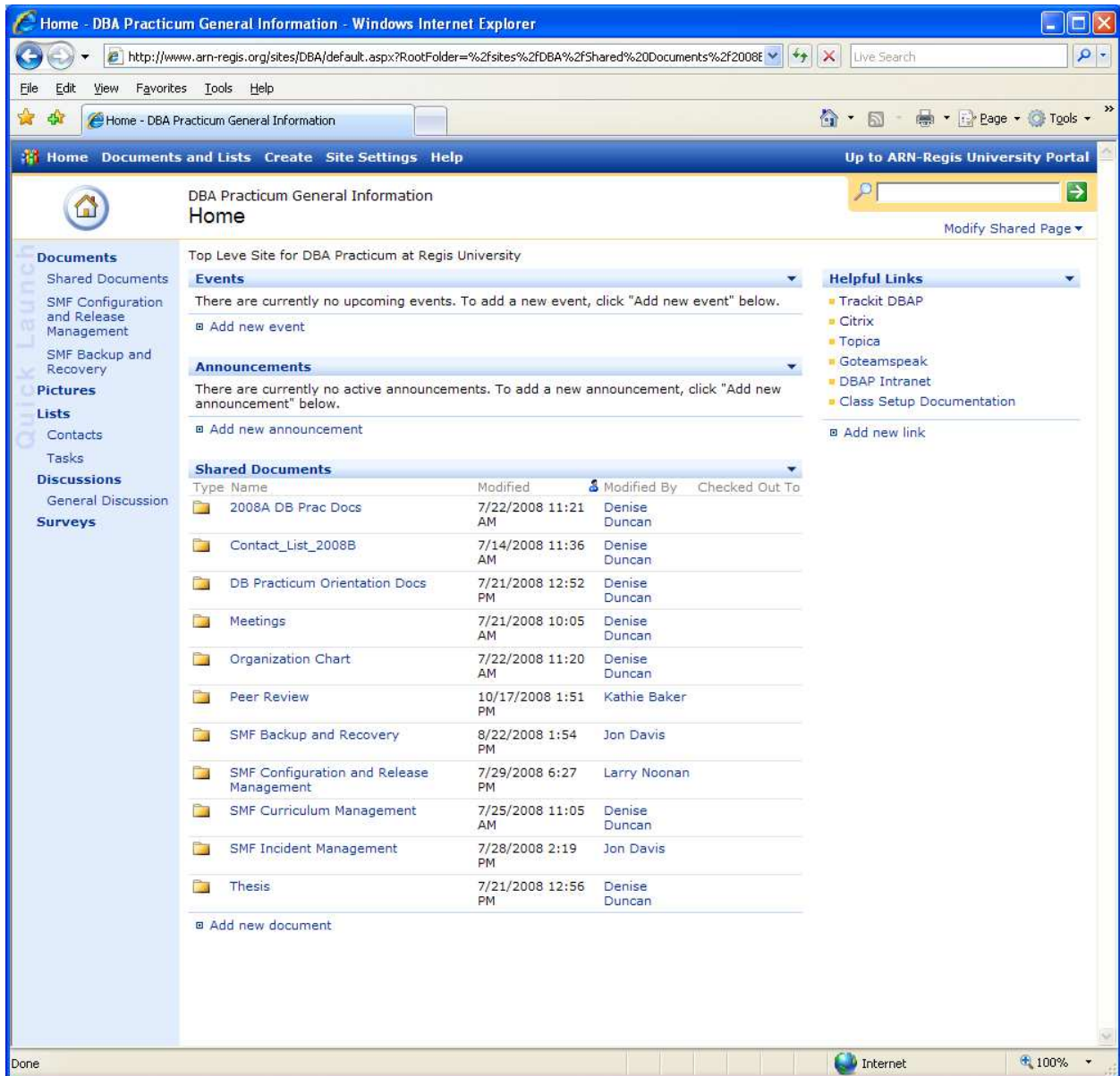documents created and utilized by the 2008B database practicum.

Home - DBA Practicum General Information - Windows Internet Explorer

http://www.arn-regis.org/sites/DBA/default.aspx?RootFolder=%2fsites%2fDBA%2fShared%20Documents%2f2008E

Live Search

File   Edit   View   Favorites   Tools   Help

Home - DBA Practicum General Information

Page ▾ Tools ▾

Home   Documents and Lists   Create   Site Settings   Help   Up to ARN-Regis University Portal

DBA Practicum General Information
Home
                                                                                                                 Modify Shared Page ▾

Documents   Top Leve Site for DBA Practicum at Regis University
  Shared Documents   **Events**   ▾   **Helpful Links**   ▾
  SMF Configuration   There are currently no upcoming events. To add a new event, click "Add new event" below.   ▪ Trackit DBAP
  and Release   ▪ Citrix
  Management   ⊞ Add new event   ▪ Topica
  SMF Backup and   ▪ Goteamspeak
  Recovery   **Announcements**   ▾   ▪ DBAP Intranet
Pictures   There are currently no active announcements. To add a new announcement, click "Add new   ▪ Class Setup Documentation
Lists   announcement" below.
  Contacts   ⊞ Add new link
  Tasks   ⊞ Add new announcement
Discussions   **Shared Documents**   ▾
  General Discussion   Type Name   Modified   ⅜ Modified By   Checked Out To
Surveys   2008A DB Prac Docs   7/22/2008 11:21 Denise
                                                          AM   Duncan

                              Contact_List_2008B   7/14/2008 11:36 Denise
                                                          AM   Duncan

                              DB Practicum Orientation Docs 7/21/2008 12:52 Denise
                                                          PM   Duncan

                              Meetings   7/21/2008 10:05 Denise
                                                          AM   Duncan

                              Organization Chart   7/22/2008 11:20 Denise
                                                          AM   Duncan

                              Peer Review   10/17/2008 1:51 Kathie Baker
                                                          PM

                              SMF Backup and Recovery   8/22/2008 1:54   Jon Davis
                                                          PM

                              SMF Configuration and Release 7/29/2008 6:27 Larry Noonan
                              Management   PM

                              SMF Curriculum Management   7/25/2008 11:05 Denise
                                                          AM   Duncan

                              SMF Incident Management   7/28/2008 2:19   Jon Davis
                                                          PM

                              Thesis   7/21/2008 12:56 Denise
                                                          PM   Duncan

                      ⊞ Add new document

Done   Internet   100%

Figure 7. 2008B_DB_Practicum Folder in SharePoint.

Similarly, Figure 8 illustrates the organization of documents created and utilized by the 2008A
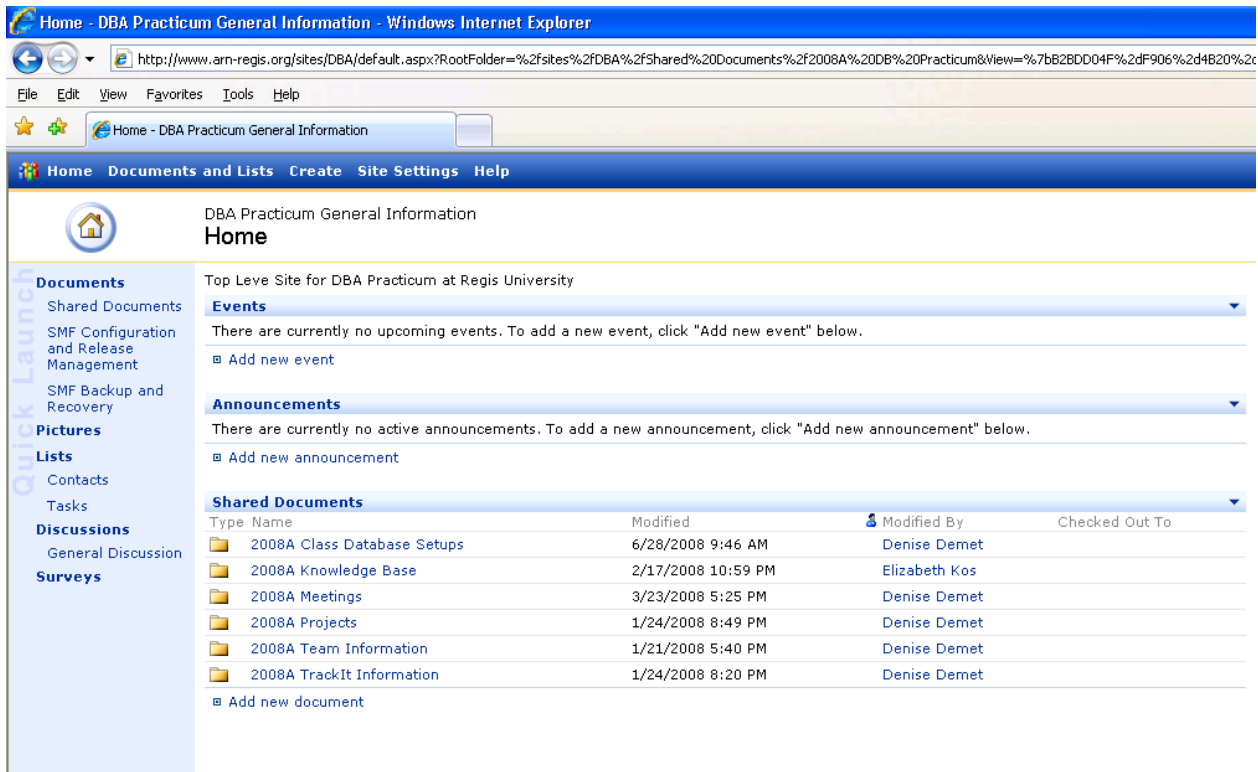
practicum.

Figure 8. 2008A DB Practicum Folder in SharePoint.

While Figures 7 and 8 highlight that the 2008A and 2008B database practicums provided a

structure for sharing knowledge, they also highlight the inconsistent nature of their knowledge

sharing efforts.

The contents of the 2008A Knowledge Base folder found in the 2008A DB Practicum
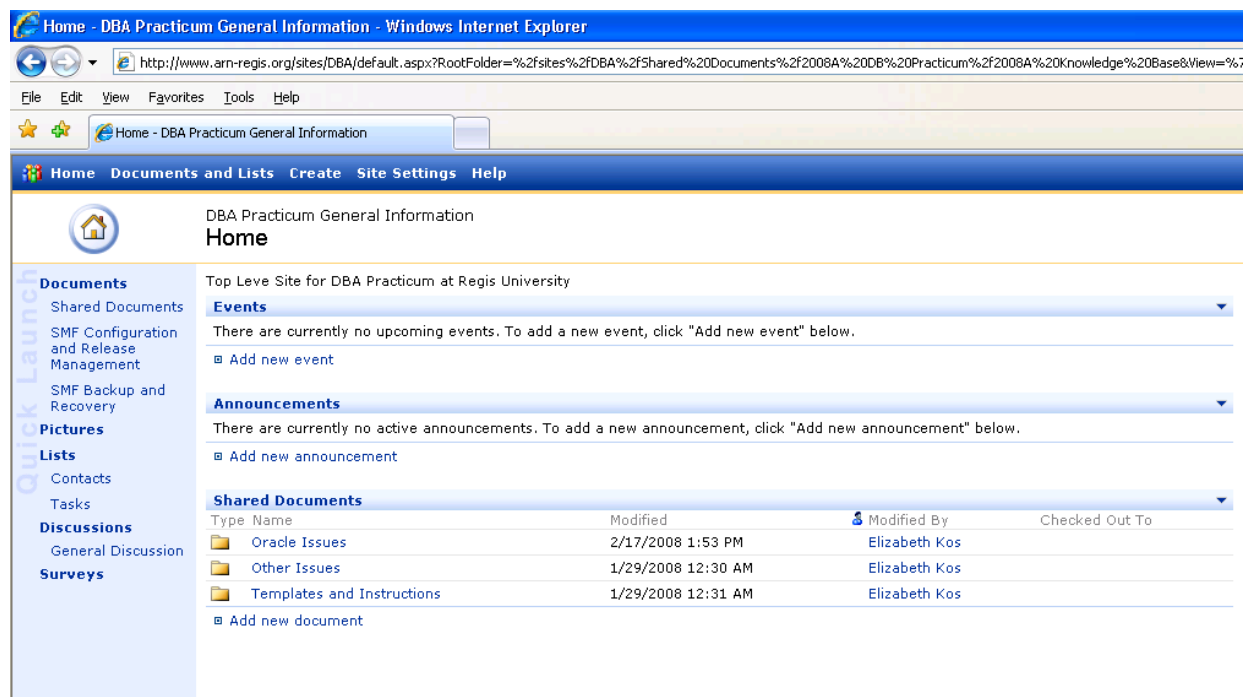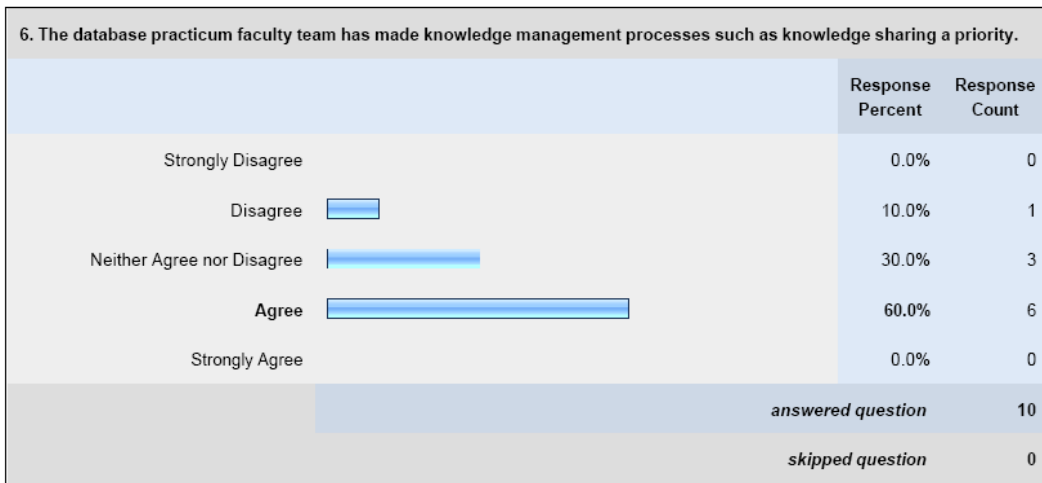
Folder are shown in Figure 9.

Figure 9. 2008A DB Practicum Knowledge Base Folder in SharePoint.

Drilling down further into the folders of the 2008A DB Practicum Knowledge Base Folder

revealed many documents created to share Oracle database setup and maintenance information.

Moreover, these documents indicated the intent to create a Knowledge Base of Resolutions and

"How To" instructions from the work order tickets resolved by the 2008A database practicum.

These documents like the documents created by the 2008B database practicum indicated a strong

intent to share knowledge. Again, in the opinion of this researcher, these efforts seemed local to

an individual database practicum, with little continuity across multiple database practicums.

Rather than building on the work of previous database practicums, it appeared to this researcher

that each database practicum began anew to share knowledge. Additionally, the differing

organizational structures implemented by various database practicums impeded the discovery

and reuse of previously shared knowledge. Moreover, the review of the SharePoint shared

documents indicated that knowledge sharing efforts were more focused on the sharing of explicit

than implicit knowledge.

While the need for knowledge sharing activities was unanimously supported by the review of literature, previous research, and the opinions of the student participants and faculty team, the response to the survey statement intended to gauge the student participant's opinion about whether the faculty team had made knowledge sharing processes a priority was less clear. 60% agreed with the survey statement, while 30% neither agreed nor disagreed, and 10% disagreed with the survey statement.

6. The database practicum faculty team has made knowledge management processes such as knowledge sharing a priority.	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	10.0%	1
Neither Agree nor Disagree	30.0%	3
Agree	60.0%	6
Strongly Agree	0.0%	0
answered question		10
skipped question		0

Research Question 3

Of the five types of knowledge sharing systems identified by Becerra-Fernandez et al. (2004), one utilized by the database practicum was the incident report database. Incident report databases are utilized to describe and disseminate information regarding unsuccessful experiences as well as incidents or malfunctions. The database practicum used the help desk functionality of Track-It! Web-based software as an incident reporting database. Figures 10, 11, and 12 show screen shots of the Track-It! Web-based interface. Figure 10 provides a screen shot of the Track-It! main menu, Figure 11 provides a screen shot of a listing of open work orders in the help desk area of Track-It!, and Figure 12 shows an example work order created in Track-It!.

Work orders were created and viewed in Track-It! by several groups within Regis University including the participants of the database practicum, the participants of the systems engineering and application development practicum, and by authorized faculty members. Additionally, a Google e-mail account was used as a method for Regis University database students and faculty to report incidents which were in turn entered as work orders in Track-It!. When work orders were entered, key meta-data was entered to track and facilitate the resolution of database practicum related issues. With resolutions to many issues frequently encountered by the database practicum, Track-It! provided both a tracking system for current incidents as well as a repository of resolutions to previous incidents.

Figure 10. Track-It! Main Menu.

Figure 11. Track-It! Help Desk Open Work Orders.
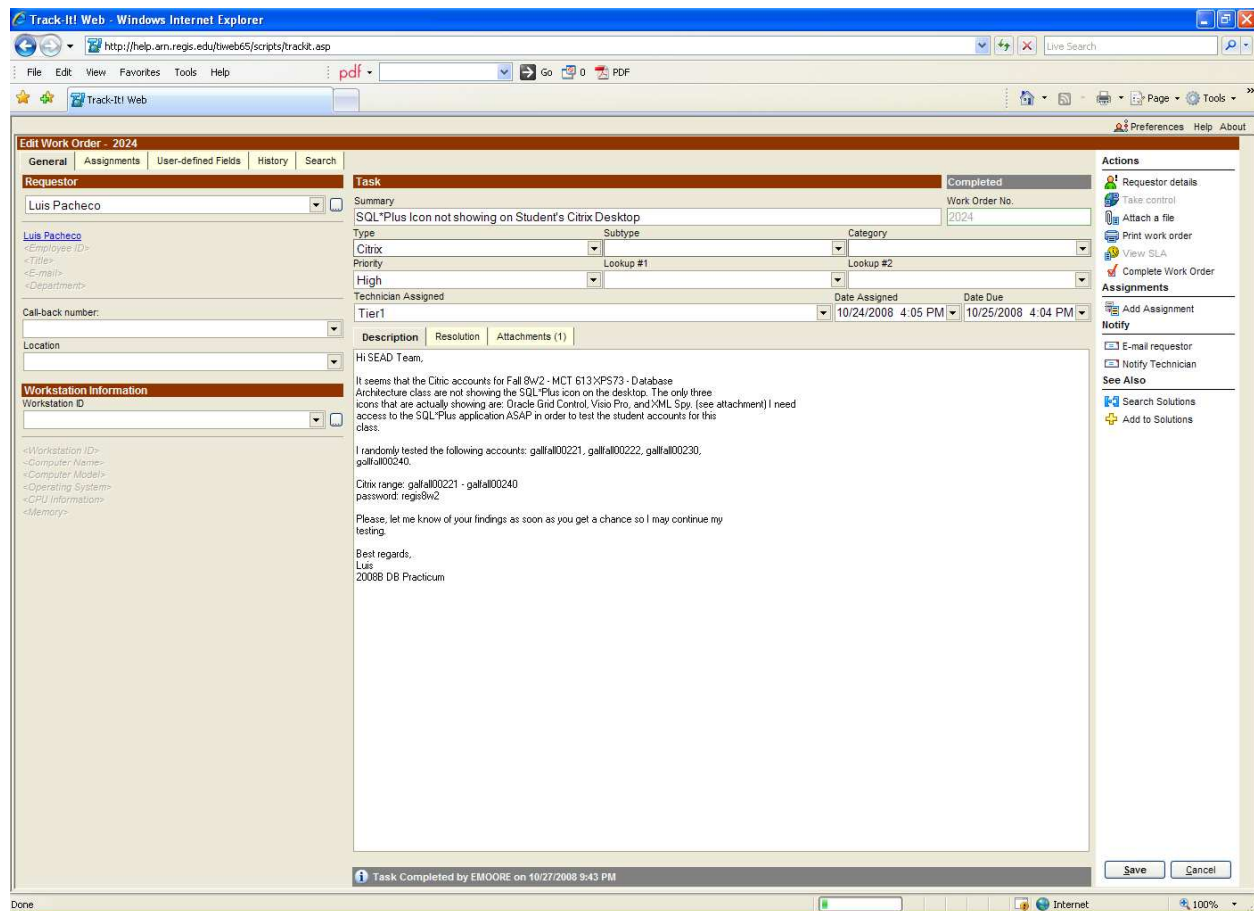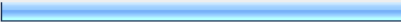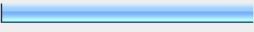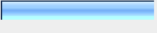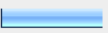
Figure 12. Track-It! Example Work Order.

The student participants of the database practicum indicated strong agreement with the identification by Becerra-Fernandez et al. (2004) of incident reporting databases as effective knowledge sharing systems. With 90% agreement to the survey statement "Incident reporting systems like Track-It are important for knowledge sharing in the database practicum", the student participants showed strong support for the use of an incident reporting system like Track-It! as a knowledge sharing system.
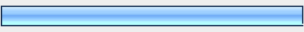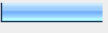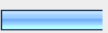
9. Incident reporting systems like TrackIt are important for knowledge sharing in the database practicum.	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	10.0%	1
Agree	80.0%	8
Strongly Agree	10.0%	1
answered question		10
skipped question		0

When asked what knowledge sharing systems or activities currently in use by the database practicum are the most effective, the faculty team responses ranged from the opinion that there are none, to the inclusion of e-mail, monthly phone calls, and the SharePoint browser-based collaboration and document-management system utilized by the database practicum. These responses also indicated support for the work of Becerra-Fernandez et al. (2004). According to Becerra-Fernandez et al. (2004), e-mail, groupware and other team collaboration mechanisms like SharePoint are important facilitating technologies for the knowledge management sub processes of exchange and socialization necessary for knowledge sharing systems. More information about the use of SharePoint in the database practicum can be found in the analysis of Research Question 2 of this chapter.

Survey statement Q26 was created to determine if the student participants agreed that the use of SharePoint by the database practicum provided an effective, available repository in support of knowledge sharing activities. The level of agreement with this statement was mixed with 50% of the student participants in agreement, and 50% neither agreeing nor disagreeing.

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26. The use of SharePoint by the database practicum provides an effective, available repository in support of knowledge sharing activities.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	50.0%	5
Agree	30.0%	3
Strongly Agree	20.0%	2
answered question		10
skipped question		0

Survey statement Q8 was created to determine if the student participants agreed that the database practicum is fully utilizing knowledge sharing systems for the sharing of both implicit and explicit knowledge with future database practicums. Their responses indicated 60% disagreement and 20% agreement with the survey statement while 20% neither agreed nor disagreed.

8. The database practicum is fully utilizing knowledge sharing systems for the sharing of both implicit and explicit knowledge with future database practicums.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	60.0%	6
Neither Agree nor Disagree	20.0%	2
Agree	20.0%	2
Strongly Agree	0.0%	0
answered question		10
skipped question		0

Survey statement Q17 was created to determine if the student participants agreed that the knowledge sharing systems used by the database practicum were reliable and available. Their

responses indicated 40% agreement and 30% disagreement with the survey statement while 30% neither agreed nor disagreed.

17. The knowledge sharing systems used by the database practicum were reliable and available.

	Response Percent	Response Count
Strongly Disagree	10.0%	1
Disagree	20.0%	2
Neither Agree nor Disagree	30.0%	3
Agree	40.0%	4
Strongly Agree	0.0%	0
answered question		10
skipped question		0
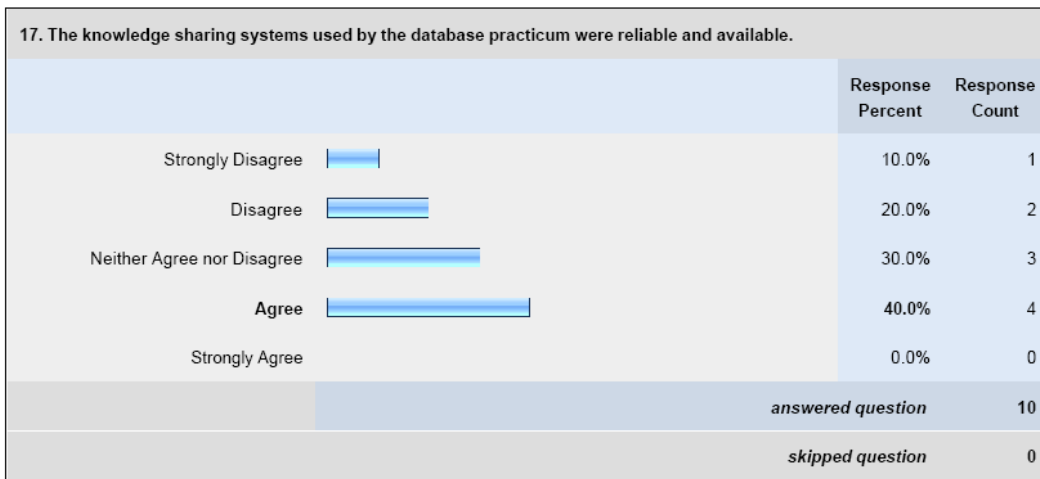
Research Question 4

The student participants of the database practicum were presented with survey statement Q21 to determine how strongly they felt that the database practicum needs to make greater use of knowledge sharing systems, mechanisms, and technologies. With 90% of the student participants in agreement with the survey statement, and only 10% neither agreeing nor disagreeing, their responses indicated strong support for the greater use of knowledge sharing activities.

21. The database practicum needs to make greater use of knowledge sharing systems, mechanisms, and technologies.

	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	10.0%	1
Agree	50.0%	5
Strongly Agree	40.0%	4
answered question		10
skipped question		0
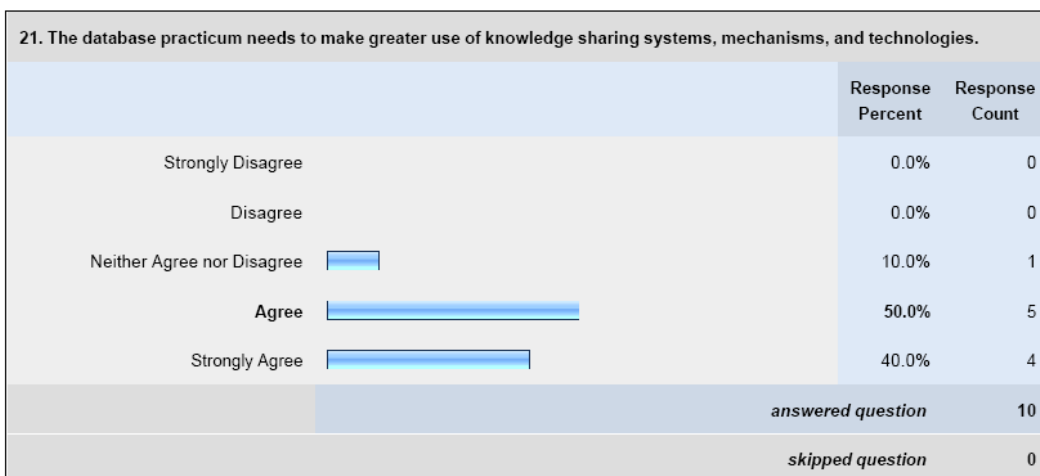
In order to determine what additional knowledge sharing systems and activities would be beneficial to the database practicum, it was helpful to first refer to the findings of the review of literature. According to Becerra-Fernandez et al. (2004), "Knowledge sharing systems are classified according to their attributes. These specific types of knowledge sharing systems include:

1. Incident report databases.

2. Alert systems.

3. Best practices databases.

4. Lesson-learned (LL) systems.

5. Expertise-locator (EL) systems"

(p. 305).

Survey questions Q4, Q12, and Q14 were created to determine how the student participants felt about incorporating more of the types of knowledge sharing systems identified by Becerra-Fernandez et al. (2004) into the database practicum.

As opposed to incident report and alert systems, best practices databases describe successful efforts. These are descriptions of previously successful ideas that are applicable to organizational processes (Becerra-Fernandez et al., 2004; Weber et al., 2001). Essentially, best practices describe the best way to perform some activity. With 80% in agreement, 10% neither agreeing nor disagreeing, and 10% disagreeing, the responses of the student participants to the survey statement "The ability to reference a best practices database would enhance the level of knowledge sharing in the database practicum" indicated a strong preference for the use of a best practices database.
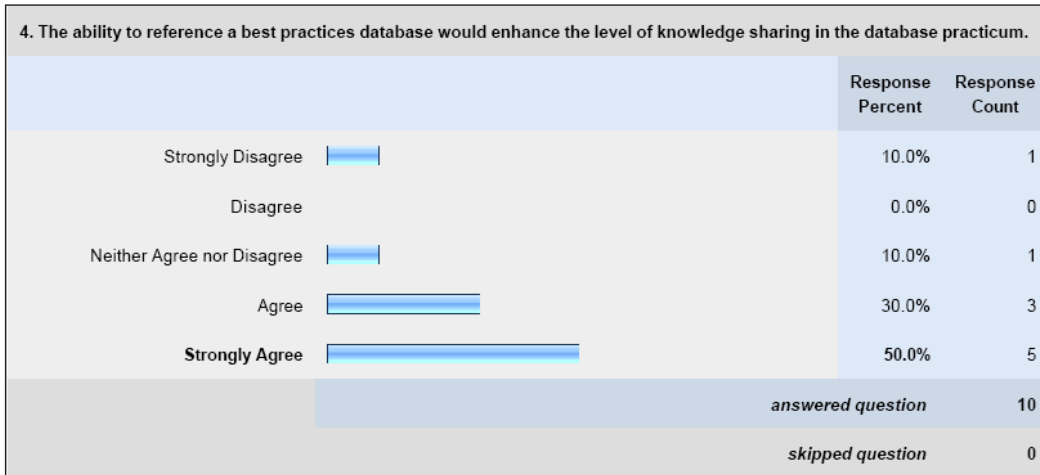
4. The ability to reference a best practices database would enhance the level of knowledge sharing in the database practicum.		Response Percent	Response Count
Strongly Disagree		10.0%	1
Disagree		0.0%	0
Neither Agree nor Disagree		10.0%	1
Agree		30.0%	3
Strongly Agree		50.0%	5
		answered question	10
		skipped question	0

The intent of Expertise-Locator (EL) knowledge sharing systems is to catalog knowledge competencies, including information not typically captured by human resources systems, in a way that is accessible across the organization (Becerra-Fernandez et al., 2004). EL systems, also referred to as yellow pages or knowledge maps, constitute a guide to knowledge rather than a repository containing it. As stated by Davenport and Prusak (1998), "Developing a knowledge map involves locating important knowledge in the organization and then publishing some sort of list or picture that shows where to find it. Knowledge maps typically point to people as well as to documents and databases" (p. 72). Based on their response to survey statement Q12, fully 100% of the student participants indicated that the database practicum would benefit from the implementation of a knowledge map or expertise locator system. Similarly, one of the faculty members indicated the need for an effective expert locater system when asked what knowledge sharing systems or activities currently in use by the database practicum are the most effective.

12. The database practicum would benefit from the implementation of a knowledge map or expertise locator system.		
	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	0.0%	0
Agree	40.0%	4
Strongly Agree	60.0%	6
answered question		10
skipped question		0

According to Weber et al. (2001), the goal of a lessons learned (LL) system is "to capture and provide lessons that can benefit employees who encounter situations that closely resemble a previous experience in a similar situation" (p. 18). The essential tasks of LL systems in support of organizational processes are to collect lessons, verify the lessons for correctness, store the lesson through indexing, formatting, and incorporation into a repository, disseminate the lesson in order to promote its reuse, and finally, reuse or apply the lesson (Weber et al., 2001). With LL systems individuals can benefit from the knowledge acquired by others. Individuals can articulate their tacit knowledge acquired through the performance of certain tasks into a more explicit format which can be more easily shared with and reused by others. The student participants also indicated strong agreement that a lessons learned system would be a valuable knowledge sharing tool for the database practicum with 90% in agreement, and 10% neither agreeing nor disagreeing with survey statement Q14.

14. A lessons learned system would be a valuable knowledge sharing tool for the database practicum.		
	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Agree nor Disagree	10.0%	1
Agree	40.0%	4
Strongly Agree	50.0%	5
answered question		10
skipped question		0
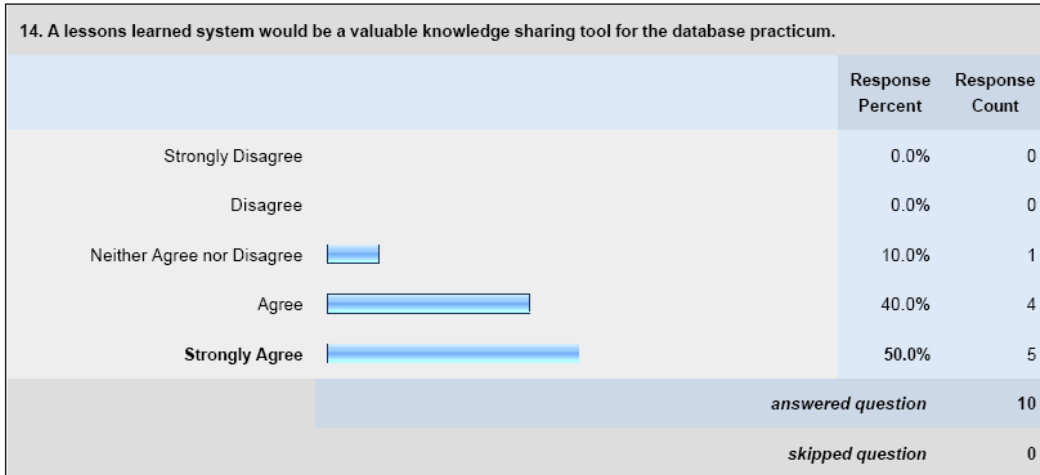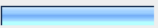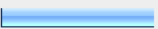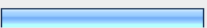
Survey statements Q16, and Q19 were devised to try to determine if the student participants agreed that certain methods for facilitating the sharing of tacit knowledge would be beneficial to the database practicum. 80% of the student participants agreed that the sharing of more tacit knowledge could be accomplished if the start and end time of multiple database practicums overlapped allowing for direct interaction between the participants of multiple database practicums while 10% neither agreed nor disagreed and 10% disagreed. Similarly, one of the faculty team members pointed out that a structure where future practicums overlap with current team members in order to build continuity and enable the sharing of tacit knowledge may be required.

16. The sharing of more tacit knowledge could be accomplished if the start and end time of multiple database practicums overlapped allowing for direct interaction between the participants of multiple database practicums.

		Response Percent	Response Count
Strongly Disagree		0.0%	0
Disagree		10.0%	1
Neither Agree nor Disagree		10.0%	1
Agree		40.0%	4
Strongly Agree		40.0%	4
		answered question	10
		skipped question	0

According to Hinds and Weisband (2003), providing easy access to and support for (including training and technical support) videoconferencing and an on-line team space facilitates shared understanding in virtual teams. With 70% in agreement, and 30% neither agreeing nor disagreeing, the student participants indicated strong agreement with the statement that the database practicum needs to incorporate the use of more video technology to better share knowledge.

19. The database practicum needs to incorporate the use of more video technology to better share knowledge.

		Response Percent	Response Count
Strongly Disagree		0.0%	0
Disagree		0.0%	0
Neither Agree nor Disagree		30.0%	3
Agree		30.0%	3
Strongly Agree		40.0%	4
		answered question	10
		skipped question	0

When asked what additional knowledge sharing systems or activities would be beneficial to current or future database practicums, the responses from the faculty team indicated the need for a more classroom like structure, an online forum via the WorldClass Learning Management

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System, an indexed system of documentation, and an upgrade of the SharePoint site.

Additionally, one faculty team member reiterated the need for an expertise locator system, and

the greater use of video technology through the implementation of a dedicated video

conferencing infrastructure.

Chapter 5 – Recommendations and Conclusions

The results of this research have clearly led to the development of practical methodologies that support the development of an internal structure for knowledge sharing between temporary virtual teams. The analysis of data collected from a variety of sources resulted in the identification of numerous methods. These methods are intended to address the challenges inherent to the temporary virtual team environment, and to provide a structure in support of knowledge sharing. The knowledge sharing systems, mechanisms, and technologies of Becerra-Fernandez et al. (2004) in particular, were evaluated in order to determine their effectiveness in an environment like the database practicum.

Students and faculty participating in the database practicum were provided with an environment where there was an emphasis on learning, managing knowledge, and providing remote administration and support in a virtual team environment. The student participants of the database practicum were aware that they would not meet any of their teammates and that they would rely on communication and information technology to communicate with each other. The responses of the student participant survey and the faculty team interview indicated that the participants in the database practicum appeared to accept the challenges of the virtual environment and were supportive of methods intended to compensate for those challenges.

The literature strongly suggests that mutual trust is necessary for virtual teams to be effective (Gibson & Cohen, 2003; Hinds & Weisband, 2003; Jarvenpaa & Leidner, 1998; Kimble, Li, & Barlow, 2000; Ocker & Fjermestad, 2008). 100% of the student participants agreed that communication behavior had a strong influence on the effectiveness of the database practicum. Additionally, the responses provided by the student participants to survey statements created to determine what communication behaviors and actions were effective in building trust

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with teammates were highly supportive of the findings of Jarvenpaa and Leidner (1998). The research of Jarvenpaa and Leidner (1998) identified the following communication behaviors and actions as effective for building trust in virtual teams: social communications, communication conveying enthusiasm, coping with technical and task uncertainty, individual initiative, predictable communication, substantive and timely response, leadership, and phlegmatic reaction to crisis. These results strongly suggest that a structured method for developing a shared understanding about the research of Jarvenpaa and Leidner (1998) among the database practicum's participants would result in a higher level of trust.

The works of Gignac (2004), Hinds and Weisband (2003), Kayworth and Leidner (2002), and Powell, Piccoli, and Ives (2004) indicate the need for positive leadership that clearly articulates goals, builds team identity, facilitates the exchange of social information, identifies and facilitates the sharing of essential knowledge, and aids in the development of shared mental models among virtual team members. 90% of student participant responses agreed that team building activities would provide a more fulfilling and productive environment for a temporary virtual team like the database practicum. Together, these results provide support for the development of a method for leaders to participate in and actively promote team building activities.

The combination of telephone conferencing and web-based desktop sharing provided an effective method for conducting monthly meetings in the database practicum. Regular meetings are useful in a virtual team environment and with only 30% of student participants agreeing that the database practicum would be a more fulfilling and productive environment if the participants were able to meet face-to-face on a regular basis, support for the method utilized was implied.

The need for knowledge sharing activities was supported by the review of literature, previous research, and the opinions of the student participants and faculty team of the database practicum. The student participants agreed 100% that effective knowledge sharing systems, mechanisms, and technologies are important to share knowledge with future database practicums. Becerra-Fernandez et al. (2004) identify repositories of information as well as groupware and other team collaboration mechanisms as effective components of knowledge sharing systems.

The database practicum utilized SharePoint as a browser-based collaboration and document-management system. This method of knowledge sharing was clearly needed; however with only 50% agreement among the student participants that the use of SharePoint by the database practicum provides an effective, available repository in support of knowledge sharing activities, it was evident that more can be done to increase the effectiveness of this method. A response from the faculty team interview pointed out that future database practicums would utilize an upgraded version of SharePoint. While this upgrade should help, based on a review of documents stored in SharePoint it appears to the researcher that a change of emphasis is necessary for this method of knowledge sharing to be more effective. While the emphasis for sharing knowledge through SharePoint was focused on sharing knowledge within individual database practicums, the researcher believes that SharePoint could be more effective if the emphasis for sharing knowledge included more focus on sharing knowledge with future database practicums. With the ability to promote continuity across database practicums, more direction and leadership by the faculty team in this change of emphasis would enable this method for knowledge sharing to be more effective.

Becerra-Fernandez et al. (2004) identify incident reporting databases as effective knowledge sharing systems. The use of TrackIt! in the database practicum provided an effective method for the implementation of an incident reporting database. This was supported by the 90% agreement by the student participants that incident reporting systems like TrackIt! are important for knowledge sharing in the database practicum.

The need for additional methods for knowledge sharing in the database practicum was indicated in the survey responses of the student participants. With only 20% agreement that the database practicum is fully utilizing knowledge sharing systems for the sharing of both implicit and explicit knowledge with future database practicums and 90% agreement that the database practicum needs to make greater use of knowledge sharing systems, mechanisms, and technologies, the support for additional knowledge sharing methods was strong.

Becerra-Fernandez et al. (2004) and Weber et al. (2001) identify best practices databases as effective knowledge sharing systems. The adoption of a method in support of the utilization of a best practices database by the database practicum was supported by the responses of the student participants. 80% of the student participants agreed that the ability to reference a best practices database would enhance the level of knowledge sharing in the database practicum. A review of the documents in SharePoint indicated that much information similar to the content intended to be stored in a best practices database had already been generated. The evidence compiled suggests a method for knowledge sharing based on a best practices database would help to realize the goals of this research. A method for sharing knowledge with a best practices database must include an emphasis on sharing knowledge with future practicums in addition to the current database practicum.

A review of documents in SharePoint suggested that there has been an emphasis on documenting resolutions to commonly occurring problems in past database practicums. The organization of these documents, however, hindered their discovery and reuse. According to Weber et al. (2001), lessons learned systems are used "to capture and provide lessons that can benefit employees who encounter situations that closely resemble a previous experience in a similar situation" (p. 18). With 90% of the student participants agreeing that a lessons learned system would be a valuable knowledge sharing tool for the database practicum, the support was strong for a method incorporating a lessons learned system.

As a participant observer, the researcher often found that one of the greatest impediments to performing the tasks necessary to provide support to the students and faculty served by the database practicum was the location of the person or persons with the knowledge and authority needed to solve a particular problem. The documentation review of SharePoint again led to examples of documents such as contact lists that contained valuable information, however, similar to the other examples, the organization of this information was often specific to a particular database practicum and was difficult to locate. In response to this issue, the researcher strongly supports a method for maintaining and utilizing an expertise-locator knowledge sharing system in the database practicum. The intent of expertise-locator knowledge sharing systems is to catalog knowledge competencies, including information not typically captured by human resources systems, in a way that is accessible across the organization (Becerra-Fernandez et al., 2004). The student participants of the database practicum expressed strong support for an expertise-locator systems as they responded with 100% agreement that the database practicum would benefit from the implementation of a knowledge map or expertise locator system. Support

from the faculty team was evident as well with an interview response indicating the need for an effective expert locator system.

The review of literature highlighted how difficult it is to effectively share tacit knowledge. According to Nonaka (1998), tacit knowledge is contained in people's minds often in the form of mental models or beliefs. It may be acquired through apprenticeships or by observation. Tacit knowledge is so highly personal to the knower, that it is hard to fully articulate and share. Additionally, Nonaka (1994) describes the process of socialization as a mode of knowledge conversion where tacit knowledge is converted to tacit knowledge through the interaction between individuals. Socialization is a process where the sharing of experiences, such as shared mental models and skills, takes place resulting in the creation of tacit knowledge.

Unfortunately, the environment of the database practicum was not conducive to Nonaka's process of socialization due to the 100% turnover rate of the student participants. A method for promoting the sharing of tacit knowledge between the participants of different database practicums through the process of socialization would be possible if there was an overlap in the duration of the individual database practicums. This would allow for the sharing and transference of knowledge between different database practicums through the direct interaction of the participants. Support for such a method was indicated as 80% of the student participants agreed that the sharing of more tacit knowledge could be accomplished if the start and end time of multiple database practicums overlapped allowing for direct interaction between the participants of multiple database practicums. Similarly, one faculty interview response indicated that a structure where future practicums overlap with current team members in order to build continuity and enable the sharing of tacit knowledge may be required.

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Becerra-Fernandez et al. (2004) identify email as a facilitating technology for the knowledge management process of socialization. The use of email was a highly effective method for communicating in the spatially and temporally dispersed virtual team environment of the database practicum. Video-conferencing is another facilitating technology for the knowledge management process of socialization identified by Becerra-Fernandez (2004). While the use of video-conferencing was not fully implemented in the database practicum, many of the student participants and one faculty team member utilized the video-conferencing features of Skype. Based perhaps on this usage, the support for video-conferencing as a method for communication in the database practicum was strong as 70% of the student participants agreed that the database practicum needs to incorporate the use of more video technology to better share knowledge. Additionally, in an interview response, a member of the faculty team stressed the need for the greater use of video technology through the implementation of a dedicated video conferencing infrastructure. Moreover, the researcher found communications utilizing video-conferencing technology to be more effective than the other methods of communication utilized in the database practicum.

The methodologies described herein offer the benefits of greater knowledge sharing in a temporary virtual team environment like the database practicum. It is important to develop a shared understanding of their need and a commitment by all participants to understand the benefits of their implementation.

Chapter 6 – Areas for Further Research

Areas for further research include the investigation of additional facilitating technologies and mechanisms in support of knowledge sharing systems. The further investigation of video-conferencing in particular as a method for communication and transferring more tacit knowledge in a virtual team environment would be of great interest to this researcher.

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Appendix A

Student Participant Survey

Survey

1. Survey questions for Jon Davis Regis University thesis research project.

Please respond to the following statements for the research project titled: Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing. Thank you for your time.

1. Effective knowledge sharing systems, mechanisms, and technologies are important to share knowledge with future database practicums.

○ Strongly Disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly Agree

2. Actions of participants that reflect the ability to cope with technical and task uncertainty build trust within the database practicum environment.

○ Strongly Disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly Agree

3. Predictable communication behavior is important for building trust in the database practicum.

○ Strongly Disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly Agree

4. The ability to reference a best practices database would enhance the level of knowledge sharing in the database practicum.

○ Strongly Disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly Agree

5. Actions of participants that display rational, disciplined behavior in reaction to crisis build trust in the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

6. The database practicum faculty team has made knowledge management processes such as knowledge sharing a priority.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

7. The lack of face-to-face communications reduces the level of knowledge sharing in the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

8. The database practicum is fully utilizing knowledge sharing systems for the sharing of both implicit and explicit knowledge with future database practicums.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

9. Incident reporting systems like TrackIt are important for knowledge sharing in the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

10. The communication and information technology utilized in the database practicum environment promotes a high-level of trust and shared understanding between its participants.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

11. Positive leadership activities can promote a higher-level of trust and shared understanding in the database practicum environment.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

12. The database practicum would benefit from the implementation of a knowledge map or expertise locator system.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

13. Substantive and timely responses to requests are communication behaviors important to build trust in the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

14. A lessons learned system would be a valuable knowledge sharing tool for the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

15. Team building activities, designed with temporary virtual teams like the database practicum in mind, would provide a more fulfilling and productive environment.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

16. The sharing of more tacit knowledge could be accomplished if the start and end time of multiple database practicums overlapped allowing for direct interaction between the participants of multiple database practicums.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

17. The knowledge sharing systems used by the database practicum were reliable and available.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

18. Communication conveying enthusiasm is an important factor for facilitating trust in the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

19. The database practicum needs to incorporate the use of more video technology to better share knowledge.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

20. The exchange of social information between database practicum participants is an important facilitator for building trust.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

21. The database practicum needs to make greater use of knowledge sharing systems, mechanisms, and technologies.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

22. Communication behavior has a strong influence on the effectiveness of the database practicum's participants.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

23. The database practicum would be a more fulfilling and productive environment if the participants were able to meet face-to-face on a regular basis.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

24. When participants take action and show a high level of individual initiative they are facilitating trust with others in the database practicum.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

25. The faculty team has incorporated many enabling conditions to enhance the effectiveness of the database practicum environment.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

26. The use of SharePoint by the database practicum provides an effective, available repository in support of knowledge sharing activities.

◯ Strongly Disagree

◯ Disagree

◯ Neither Agree nor Disagree

◯ Agree

◯ Strongly Agree

2. Informed Consent Form for Jon Davis Regis University thesis research projec...

1. INFORMED CONSENT FORM FOR STUDENT PARTICIPANTS

RESEARCH PROJECT

Title of Research Project: Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing.

You are invited to participate in a study that will measure knowledge sharing and communications activities in the 2008B database practicum. The results of the study will be used to evaluate the practical methodologies that support the development of an internal structure to support knowledge sharing between temporary virtual teams. In addition, this study is being conducted to fulfill the requirements of a Thesis Project. The study is being conducted by Jon Davis. Jon Davis can be reached at 303-823-8333 or e-mail jonfdavis@hotmail.com. This project is supervised by the student's Thesis Advisor, Charles Thies, Regis University, 3333 Regis Boulevard, Denver, Colorado 80221-1099, cthies@regis.edu, (719) 310-9887.

Participation in this study should take about 15 minutes of your time. Participation will involve responding to 26 statements about knowledge sharing and communications activities. Participation in this project is strictly voluntary. The risks associated with this project are minimal. If, however, you experience discomfort you may discontinue the interview at any time. We respect your right to choose not to answer any questions that may make you feel uncomfortable. Refusal to participate or withdrawal from participation will involve no penalty or loss of benefits to which you are otherwise entitled.

Your responses will be identified by code number only and will be kept separate from information that could identify you. This is done to protect the confidentiality of your responses. Only the researcher will have access to your individual data and any reports generated as a result of this study will use only group averages and paraphrased wording. However, should any information contained in this study be the subject of a court order or lawful subpoena, Regis University might not be able to avoid compliance with the order or subpoena. Although no questions in this interview address it, we are required by law to tell you that if information is revealed concerning suicide, homicide, or child abuse and neglect, it is required by law that this be reported to the proper authorities.

Survey

If you have any concerns or complaints about how you were treated during the interview, please contact Mr. Bud May, the director of the Regis University Institutional Review Board at (303-458-4206).You may keep this page for your records. Please sign below if you understand and agree to the above. If you do not understand any part of the above statement, please ask the researcher any questions you have.

I have read and understood the foregoing descriptions of the study called Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing. I have asked for and received a satisfactory explanation of any language that I did not fully understand. I agree to participate in this study, and I understand that I may withdraw my consent at any time. I have received a copy of this consent form.

Note: If this document is being sent electronically, your typed signature will be considered your signature.

Please type your name: [   ]

Please enter your phone #: [   ]

Please enter today's date: [   ]

Appendix B

Faculty Team Interview

Interview

1. Interview questions for Jon Davis Regis University thesis research project.

Please answer the following questions for the research project titled: Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing. Thank you for your time.

1. How does the lack of face-to-face communications in the database practicum environment affect the levels of trust and shared understanding among participants?

2. How do you foster trust and shared understanding among the participants of the database practicum?

3. How would you describe the communication behaviors and participant actions of effective participants in the database practicum?

4. How important are knowledge sharing activities to temporary virtual teams such as the database practicum?

5. What knowledge sharing systems or activities currently in use by the database practicum are the most effective? Why?

6. What additional knowledge sharing systems or activities would be beneficial to current or future database practicums? Why?

2. Informed Consent Form for Jon Davis Regis University thesis research projec...

* 1. INFORMED CONSENT FORM FOR FACULTY TEAM PARTICIPANTS

RESEARCH PROJECT

Title of Research Project: Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing.

You are invited to participate in a study that will measure knowledge sharing and communications activities in the 2008B database practicum. The results of the study will be used to evaluate the practical methodologies that support the development of an internal structure to support knowledge sharing between temporary virtual teams. In addition, this study is being conducted to fulfill the requirements of a Thesis Project. The study is being conducted by Jon Davis. Jon Davis can be reached at 303-823-8333 or e-mail jonfdavis@hotmail.com. This project is supervised by the student's Thesis Advisor, Charles Thies, Regis University, 3333 Regis Boulevard, Denver, Colorado 80221-1099, cthies@regis.edu, (719) 310-9887.

Participation in this study should take about 30 minutes of your time. Participation will involve responding to 6 open-ended questions about knowledge sharing and communications activities. Participation in this project is strictly voluntary. The risks associated with this project are minimal. If, however, you experience discomfort you may discontinue the interview at any time. We respect your right to choose not to answer any questions that may make you feel uncomfortable. Refusal to participate or withdrawal from participation will involve no penalty or loss of benefits to which you are otherwise entitled.

Your responses will be identified by code number only and will be kept separate from information that could identify you. This is done to protect the confidentiality of your responses. Only the researcher will have access to your individual data and any reports generated as a result of this study will use only group averages and paraphrased wording. However, should any information contained in this study be the subject of a court order or lawful subpoena, Regis University might not be able to avoid compliance with the order or subpoena. Although no questions in this interview address it, we are required by law to tell you that if information is revealed concerning suicide, homicide, or child abuse and neglect, it is required by law that this be reported to the proper authorities.

If you have any concerns or complaints about how you were treated during the

interview, please contact Mr. Bud May, the director of the Regis University Institutional Review Board at (303-458-4206).You may keep this page for your records. Please sign below if you understand and agree to the above. If you do not understand any part of the above statement, please ask the researcher any questions you have.

I have read and understood the foregoing descriptions of the study called Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation towards the Development of an Internal Structure to Support Knowledge Sharing. I have asked for and received a satisfactory explanation of any language that I did not fully understand. I agree to participate in this study, and I understand that I may withdraw my consent at any time. I have received a copy of this consent form.

Note: If this document is being sent electronically, your typed signature will be considered your signature.

Please type your name:	
Please enter your phone #:	
Please enter today's date:	

Appendix C

Regis University IRB Approval Letter

REGIS UNIVERSITY

Academic Affairs
Academic Grants

3333 Regis Boulevard, H-4
Denver, Colorado 80221-1099

303-458-4206
303-964-3647 FAX
www.regis.edu

IRB – REGIS UNIVERSITY

October 31, 2008

Jon Davis
101 Bohn Ct.
Lyons, CO 80540

RE: IRB #: 057-08

Dear Jon:

Your application to the Regis IRB for your project "Effective Progression of Temporary Virtual Teams over Time: A Pragmatic Investigation Towards the Development of an Internal Structure to Support Knowledge Sharing," was approved as exempt on October 29, 2008.

The designation of "exempt," means no further IRB review of this project, as it is currently designed, is needed.

If changes are made in the research plan that significantly alter the involvement of human subjects from that which was approved in the named application, the new research plan must be resubmitted to the Regis IRB for approval.

Sincerely,

Edwin May
Director

Annotated Bibliography

Alavi, M. & Leidner, D. (2001). Knowledge management and knowledge management systems:

    Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107-136.

        In this paper, the authors provide a review and interpretation of knowledge literatures in

        different fields with a focus on identifying important areas for future research. A detailed

        process view of organizational knowledge management is presented with an emphasis on

        the potential role of information technology in this process.

Becerra-Fernandez, I., Gonzalez, A., & Sabherwal, R. (2004). *Knowledge management:*

    Challenges, solutions, and technologies. Upper Saddle River, New Jersey: Pearson/Prentice

    Hall.

        In this book, the authors examine knowledge management (KM) principles from several

        perspectives. KM solutions for the discovery, capture, sharing, and application of

        knowledge are presented. The KM systems, mechanisms, technologies, and infrastructure

        which support and enable KM solutions are described in detail.

Cuevas, H. M., Fiore, S. M., Salas, E., & Bowers, C. A. (2004). Virtual teams as sociotechnical

    systems. In S. H. Godar & S. P. Ferris (Eds.), *Virtual and collaborative teams: Process,*

    technologies, and practice (pp. 1-19). Hershey, PA: Idea Group Publishing.

        In this book's chapter, the authors adopt a sociotechnical systems approach to understand

        the challenges faced by members of an organizational unit that is not constrained by

        geographical, temporal, organizational, or national boundaries. Additionally, the

        organizational psychology literature on group productivity, motivation, and shared

        mental models is reviewed to better understand team performance within the context of

        distributed environments, and to offer guidelines and interventions for organizational

practice.

Davenport, T., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. New York: Harvard Business School Press.

> This book helps the reader acquire a preliminary understanding of what knowledge and knowledge management is within organizations. Many aspects of knowledge management in the organization including generation, codification, transfer, and roles and skills are explained. The authors also provide many examples of organizations that have begun to more effectively manage their knowledge assets.

Demsetz, H. (1991). The theory of the firm revisited. In O. E. Williamson & S. G. Winter (Eds.), *The nature of the firm* (pp. 159-178). New York: Oxford University Press.

> In this book's chapter, the author discusses why the costless information that is assumed in the perfect competition model renders the model ineffective for studying the firm. The author stresses that a more complete theory of the firm must give greater weight to information cost than is given in previous theories.

Dixon, N. (2000). *Common knowledge: How companies thrive by sharing what they know*. New York: Harvard Business School Press.

> In this book, the author presents insights into how organizational knowledge is created and how it can be effectively shared. Based on the results of a study of the knowledge sharing practices of many companies, the author provides details of successful methods for knowledge sharing.

Draft, R. L., & Lengel, R. H. (1986). Organization information requirements, media richness, and structural design. *Management Science, 32*(5), 554-571.

> In this paper, the authors seek to describe why organizations process information. The

authors propose models that show how organizations can be designed to meet the information needs of technology, interdepartmental relations, and the environment.

Dyer, G., & McDonough, B. (2001). The state of KM. *Knowledge Management, 5*. Retrieved October 1, 2008 from

http://www.providersedge.com/docs/km_articles/The_State_of_KM.pdf.

In this article, the authors, in association with Knowledge Management magazine and International Data Corp., present the results of an extensive electronic survey of enterprise deployment of knowledge management initiatives. The intent of this survey was to gain an understanding of KM use at companies that have identified an interest in KM or that have already begun KM projects.

Evans, P., & Wurster, T. S. (1999). Getting real about virtual commerce. *Harvard Business Review*, *November/December, 77*(6), 85-94. Harvard Business School Publishing.

In this article, the authors analyze the competition for business among electronic commerce retailers, brand suppliers, and physical retailers. The authors also present strategies for successful competition.

Feagin, J., Orum, A., & Sjoberg, G. (1991). *A case for case study*. Chapel Hill, NC: University of North Carolina Press.

In this book, the authors provide the close investigation of single instances of social phenomena as a rationale for an alternative to quantitative research. Beginning with an overview of the central methodological issues involved in the use of the case study method, this book continues with well-known scholars describing how they undertook case study research in order to understand changes in a variety of social environments.

Fisher, K., & Fisher, M. (2000). *The distance manager: A hands on guide to managing off-site*

employees and virtual teams. New York: McGraw-Hill.

> In this book, the authors provide pragmatic advice on how to become an effective distance manager. Based on their study of dozens of companies in a variety of organizational environments, the authors present key principles, skills, techniques, and technical tools required to succeed as a distance manager.

Gibson, C., & Cohen, S. (2003). *Virtual teams that work: Creating conditions for virtual team effectiveness*. San Francisco: Jossey-Bass.

> In this book, the authors define the nature of virtual teams and discuss their many potential advantages. The authors also present many barriers to effective virtual teams as well as key enabling conditions intended to help virtual teams overcome these barriers. Additionally, this book provides insight into the many socio-technical challenges encountered by virtual teams.

Gignac, F. (2004). *Building successful virtual teams*. Boston: Artech House.

> In this book, the author presents a methodology for building and implementing successful virtual teams in any organization. In doing so, the author describes and explains practical tools in virtual team design, project management, and change management.

Grant, R. M. (1996a). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*, 109-122.

> In this paper, the coordination mechanisms through which firms integrate the specialist knowledge of their members is explored. The author views knowledge as residing in individuals and the primary role of the organization is described as knowledge application rather than knowledge creation.

Grant, R. M. (1996b). Prospering in dynamically-competitive environments: Organizational

capability as knowledge integration. *Organization Science, 7*(4), 375-387.

    In this article, the author develops a knowledge-based theory of organizational capability.
Research into competitive dynamics, the resource-based view of the firm, organizational
capabilities, and organizational learning is presented and examined.

Hinds, P. J. & Weisband, S. P. (2003). Knowledge sharing and shared understanding in virtual
teams. In C. B. Gibson & S. G. Cohen (Eds.), *Virtual teams that work: Creating conditions
for virtual team effectiveness* (pp. 21-36). San Francisco: Jossey-Bass.

    In this book's chapter, the authors describe the advantages of shared understanding in
virtual teams. Additionally, the authors suggest that team members need to have shared
understanding and mutual expectations among several dimensions: goals, tasks, work and
team processes, and member characteristics and roles.

Jarvenpaa, S. L., & Ives, B. (1994). The global network organization of the future: Information
management opportunities and challenges. *Journal of Management Information System*, *10*
(4), 25-57. Armonk, NY, USA, M. E. Sharpe, Inc.

    In this article, the authors explore the opportunities and challenges that networked
organizations will present for information technology management. The authors explain
how the success of future organizations, in a departure from legacy organizational
models, will need to be designed around more advanced computer and communications
technology. They explain how the success of these future organizations will come from
the ability to couple to, and decouple from, the networks of knowledge nodes.

Jarvenpaa, S. L., & Leidner, D. E. (1998). Communication and trust in global virtual teams.
Journal of Computer-Mediated Communication, 3(4). Retrieved September 19, 2008, from
http://jcmc.indiana.edu/vol3/issue4/jarvenpaa.html.

This paper explores the challenges involved in building and maintaining trust in global virtual teams. A series of case studies of global virtual teams whose culturally, temporally, and spatially separated team members relied on asynchronous and synchronous computer-mediated communication is presented and analyzed.

Jensen, M. C. & Meckling, W. H. (1996). Specific and general knowledge, and organizational structure. In P. S. Myers (Eds.), *Knowledge management and organizational design* (pp. 17-38). Boston, MA: Butterworth-Heinemann.

In this books chapter, the authors examine different types of knowledge with a focus on the differing costs associated with transferring or transmitting that knowledge.

Kayworth, T. R., & Leidner, D. E. (2002). Leadership effectiveness in global virtual teams. *Journal of Management Information Systems, 18*(3), 7-40.

In this article, thirteen culturally diverse global teams from locations in Europe, Mexico, and the United States are studied to determine the effectiveness of differing leadership skills. The results of this study provide useful information for managers who are interested in developing or are involved in global virtual teams.

Kemmis, S. & McTaggart, R. (1998) *The action research reader. Third edition.* Victoria: Deakin University Press.

In this book, the authors present key papers from the history of action research. Additionally, examples of teacher action research conducted by teachers are presented.

Kimble, C., Li, F. & Barlow, A. (2000). *Effective virtual teams through communities of practice*. Strathclyde Business School Management Science Working Paper No. 2000/9. Retrieved September 5, 2008, from http://ssrn.com/abstract=634645.

This paper examines the nature of virtual teams and presents a framework for their

categorization. The concept of virtual team members operating in both a physical and electronic space is explored. Barriers to effective virtual teams are presented, and the use of a Community of Practice is studied as a means to overcome these barriers.

Kramer, R., & Tyler, T. (1996). *Trust in Organizations: Frontiers of theory and research*. Thousand Oaks: Sage Publications, Inc.

In this book, the authors present a cross-disciplinary perspective of organizational trust. In doing so, the authors discuss the effects of social and organizational structures on trust and how trust affects organizational functioning.

Kuhn, O., & Abecker, A. (1997). Corporate memories for knowledge management in industrial practice: Prospects and challenges. *Journal of Universal Computer Science, 3*(8), 929-954.

In this article, the authors present and discuss the concept of Corporate or Organizational Memory. Based on their studies on Corporate Memories for supporting various aspects in the product life-cycles of three European corporations, the authors offer a general framework for the development methodology, architecture, and technical realization of a Corporate Memory.

Lipnack, J., & Stamps, J. (1997). *Virtual teams: Reaching across space, time, and organizations with technology*. New York, NY: John Wiley and Sons, Inc.

In this book, the authors examine the next evolutionary leap in teamwork, "virtual teams", which are made possible by the Internet, groupware, and Intranets. How virtual teams allow companies to use the combined talents of the best people for the job is also presented.

Lee, G. K., & Cole, R. E. (2003). From a firm-based to a community-based model of knowledge creation: The case of the Linux kernel development. *Organization Science, 14*(6), 633-649.

In this paper, the authors propose a new model of knowledge creation in purposeful, loosely coordinated, distributed systems as an alternative to a firm-based model. By comparing and contrasting the virtual community based Linux kernel development project with the traditional firm-based development model, the authors show how knowledge creation expands beyond the boundaries of the firm.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), February, 14-37.

In this paper, a paradigm for managing the dynamic aspects of organizational knowledge creating processes is proposed. The author develops and applies a theoretical framework intended to provide an analytical perspective on the constituent dimensions of organizational knowledge creation.

Nonaka, I. (1998). The knowledge creating company. In *Harvard business review on knowledge management*. Boston, MA: Harvard Business School Press.

In this article, the methods of knowledge creation employed by successful Japanese companies are presented and contrasted to the differing methods used by managers of many Western companies. The author describes a more holistic approach to knowledge creation utilized by Japanese companies. The distinction and interaction between tacit and explicit knowledge is explained as a spiral of knowledge in which knowledge is created, shared, and utilized.

Ocker, R. J., & Fjermestad, J. (2008) Communication differences in virtual design teams: Findings from a multi-method analysis of high and low performing experimental teams. *ACM SIGMIS Database, 39*(1), 51-67. New York, NY, USA: ACM.

In this article, the authors present the results of a multi-method study of the asynchronous

communications methods of four high performing and four low performing distributed

virtual design teams. In their analysis, the effectiveness of the differing communications

methods used by the studied teams is described.

O'Leary, D. E. (1999). Knowledge management for best practices. *Intelligence, 4*(10), 12-24.

In this article, the authors examine the significance of business process reengineering in

information systems. The effect of business process reengineering in the development

and implementation of so-called *best practices* or best ways of performing processes is

examined and presented.

Peddibhotla, N. B., & Subramani, M. R. (2008). Managing knowledge in virtual communities

within organizations. In I. Becerra-Fernandez & D. Leidner (Eds.), *Knowledge*

management: An evolutionary view: Advances in management information systems (pp.

229-247). Armonk, New York: M. E. Sharpe.

In this book's chapter, the authors provide a synthesis of prior work on the topic of

managing knowledge in virtual communities. Focusing on virtual communities within

organizations, key findings of prior studies along with recommendations for future

research are provided.

Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: A review of current literature and

directions for future research. *ACM SIGMIS Database*, *35*(1), 6-36. York, NY, USA: ACM.

This article provides a review of current virtual team research and publications. Issues

pertaining to inputs, socio-emotional processes, task processes, and outputs provide the

basis for the categorization of this literature review. The results of this review are

presented to help develop and guide the future research of virtual teams.

Soy, S. (1997). The case study as a research method. Retrieved October 20, 2008, from

http://faculty.cbu.ca/pmacintyre/course_pages/MBA603/MBA603_files/The%20Case%20S

tudy%20as%20a%20Research%20Method.pdf.

   In this article, the author offers practical advice and guidance on how to design and

   conduct case study research. Additionally, the author provides a six-step framework,

   based on the works of renowned case study researchers, for conducting case study

   research.

Staples, D. S., Wong, I. K., & Cameron, A. F. (2004). Best practices for virtual team effectiveness.

   In D. J. Pauleen (Eds.), *Virtual teams: Projects, protocols and processes* (pp. 160-185).

   Hershey, PA: Idea Group Publishing.

   In this book's chapter, the authors present the results of studies of virtual teams intended

   to identify the best practices for individual team members, the best practices for leaders

   and sponsors of virtual teams, and the best practices for the organizations that the virtual

   teams are a part of.

Sveiby, K. (1997). *The new organizational wealth: Managing and measuring knowledge-based*

   assets. San Francisco, CA: Berrett-Koehler Publishers.

   This book introduces and explores the concept of knowledge as an intangible asset

   which organizations must perceive and manage differently than more traditional assets.

   The author describes a conceptual framework of the knowledge organization with a

   focus on the measurement and management of knowledge as an intangible asset.

Vinaja, R. (2003). Major challenges in multi-cultural virtual teams. *Proceedings / American*

   Institute for Decision Sciences, Southwest Region (n.d.), 341- 346. Retrieved September

   20, 2008, from http://www.sbaer.uca.edu/research/swdsi/2003/Papers/068.pdf.

In this paper, many of the challenges faced by multi-cultural virtual teams are described. Additionally, the managerial implications of theses challenges are explained.

Weber, R., Aha, D. W., & Becerra-Fernandez, I. (2001). Intelligent lessons learned systems. *Expert Systems with Applications, An International Journal, 20*(1), 17-34.

In response to recent studies which have shown that software systems for supporting lesson dissemination do not effectively promote knowledge sharing, the authors of this article survey lessons learned processes and systems, detail their capabilities and limitations, examine lessons learned system design issues, and identify how artificial intelligence technologies can contribute to knowledge management solutions for these systems.

Yin, R. (2003). *Case study Research: Design and methods, Third Edition*, Applied Social Research Methods Series, Vol 5. Thousand Oaks: Sage Publications, Inc.

In this book, the author provides a comprehensive presentation of all aspects of the case study research methodology including direction on problem definition, design, data collection, data analysis, and reporting. The author explains the importance of case study research to a wide range of disciplines.