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An Empirical Investigation of Factors Influencing IT Professionals' Knowledge Sharing Behavior in Organizations

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An Empirical Investigation of Factors Influencing IT Professionals' Knowledge Sharing Behavior in Organizations

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Abstract

Knowledge management is important for competitive advantage in knowledge-based organizations. A critical aspect of managing knowledge is the knowledge sharing behavior of organizational members. A positive relationship between knowledge sharing and organizational performance has been widely supported in prior literature. The vast body of extant literature on knowledge sharing behavior has identified that individuals possess specialized knowledge which can be valuable to the organization, specifically when it is shared.

Knowledge sharing behavior however is influenced by several factors which either facilitate or inhibit knowledge sharing among individuals in an organizational context. A better understanding and management of these factors would help organizations in realizing the expected benefits of knowledge sharing.

Prior literature has examined the direct effects of several antecedents of knowledge sharing behavior utilizing rational or social theoretical perspectives. The interactional perspective, however, has received little attention in prior research. This approach recognizes the importance of better understanding how factors from diverse theoretical perspectives influence knowledge sharing behavior in organizations, since no single theoretical perspective can completely explain the phenomena.

Several individual and contextual factors such as perceptions of equity, work group cohesiveness and emotional disposition are expected to influence individuals' in sharing

their specialized knowledge. However, the influence of these factors on knowledge sharing has not been investigated in prior literature.

This study investigates the relationship between the presence of specialized knowledge and knowledge-sharing behavior under the influence of contextual factors. We developed a contingency model of knowledge sharing behavior drawing upon the factors identified from prior literature and empirically test the model using survey responses from IS professionals. The research provides useful insights into knowledge sharing behavior in organizations. We discuss the implications for research and practice and suggest directions for future research.

Keywords: *Equity; procedural justice; distributive justice; informational justice; interpersonal justice; emotions; knowledge sharing behavior; specialization; work group cohesiveness; social norms, evaluation apprehension, loss of power.*

Introduction

Knowledge sharing is a critical organizational process that has far reaching impacts on the performance and capabilities of an organization. The importance of knowledge as a critical resource for organizations in gaining competitive advantage has been recognized in prior research (Grant, 1996; Davenport and Prusak, 1998; Sosa, 2009; Volberda et al, 2010). Evidence in support of the importance of knowledge sharing and its effects on organizational performance has been noted in prior research as well (e.g. Quigley et al, 2007; Bock and Kim, 2002; Kogut and Zander, 1992; Nonaka and Takeuchi, 1995).

Knowledge sharing in organizations attains significance since information processing is considered to be a basic requirement for organizing work (Arrow, 1974; Daft and Macintosh, 1981). The required flows of information, or knowledge, are facilitated through organizational design, which involves the specification of the relationships between tasks and work groups through information technology (e.g. KM systems), to ensure performance and consistency in employee behaviors (Zmud, 1984).

Organizational efforts frequently involve investment of large amounts of money on KM systems. News reports in press, based on the Knowledge Management Spending Report by Gartner¹ state that US companies spent 73 Billion USD on Knowledge Management technologies and, spending was expected to grow by nearly 16%, by 2008.

¹ In press, Knowledge Management Spending Report by Gartner Inc. (formerly AMR Research).
<http://www2.prnewswire.com/cgi-bin/stories.pl?ACCT=109andSTORY=/www/story/09-25-2007/0004669492&EDATE=>

Investments in KM technology alone are insufficient for improving organizational performance (Cross and Baird, 2000). One of the key factors missing maybe knowledge sharing as investments in technology by itself, however, cannot facilitate knowledge sharing when individuals are reluctant to share knowledge (McDermott, 1999). This argument is supported by prior research, which recognizes that the reason for the failure of Knowledge Management (KM) initiatives is *employee reluctance* to share knowledge (Alavi and Leidner, 2001; Bock et al., 2005; Davenport and Prusak, 1998; Kankanhalli et al., 2005). Employee reluctance can arise from several factors therefore, if organizations have to realize the expected benefits from large investments in KM efforts, these factors must be identified and their direct and indirect effects on knowledge sharing behavior must be understood and successfully managed (Argote et al, 1990; Baum and Ingram, 1998).

Prior literature has identified conditions that may be favorable for knowledge sharing in organizations such as:

- a) Individuals possess unique or specialized knowledge which can be contributed (e.g. Lewis, 2003; Wasko and Faraj, 2005; Faraj and Sproull, 2000),
- b) Individuals have the motivation to share it (Osterloh and Frey, 2000), and
- c) Contextual factors in work groups facilitate knowledge sharing processes (Nahapiet and Ghoshal, 1998); since the process of knowledge sharing requires effort in overcoming concerns related to the loss of ownership of knowledge once knowledge is shared, or made available to others (Orlikowski, 1993; Goodman and Darr, 1998; Kostova, 1999; Gray, 2001; Kankanhalli et al, 2005; Liao, 2008).

The inherent tensions embedded within, and among the three criteria identified above have allowed researchers to investigate the phenomenon of knowledge sharing behaviors using several frameworks for understanding the relationships between individual characteristics, interpersonal factors, organizational processes and environmental factors (e.g. Holsapple and Joshi, 2002; Ipe, 2003; Grover and Davenport, 2001).

To better understand the phenomenon of knowledge sharing, researchers have examined knowledge sharing behaviors utilizing several theoretical perspectives such as the Social Exchange Theory (Blau, 1964), Knowledge-Based View (KBV) of the firm (Spender, 1996; Nonaka and Takeuchi, 1995), Social Capital and the creation of Intellectual Capital (Nahapiet and Ghoshal, 1998) and the Transactive Memory Systems (TMS) theory (Wegner et. al., 1985; Wegner, 1987) which have contributed to a better understanding of the complexities involved in knowledge sharing processes.

Bashorat (2006) examined the influence of justice² perceptions on attitudes and organizational climate, and found that attitudes and norms were significant predictors of intention to share knowledge, consistent with Bock et al (2005); rather than the direct influence of the perceptions of justice which were found to be weak predictors of intention to share knowledge.

Perceptions of equity reflect the feelings of fair or unfair treatment meted out to individuals, based on the actions or behaviors enacted by *other* individuals, and the

² Prior literature examining issues related to fairness and justice have used the terms fairness and justice interchangeably (Cohen-Charash and Spector, 2001, pg. 279). Consistent with prior literature, we use the terms interchangeably in this dissertation as well.

management in the organization. Perceptions of equity can trigger strong emotional responses which in turn influence attitudes and behaviors. Several dysfunctional consequences of inequity have been identified in prior literature. When perceptions of equity are low i.e. individuals experience inequity, individuals are likely to respond less positively to other members affecting work group cohesiveness and they're also likely to reduce their inputs and cooperation. Low levels of cohesiveness reduce opportunities for reciprocal actions and interactions, consequently reducing knowledge sharing among individuals.

Prior literature has found emotion to be a good predictor of behavior (Zuboff, 1988) due to cognitive appraisal processes occurring within individuals (Han et al, 2007; Lerner and Keltner, 2000). Prior literature has found that individuals may share knowledge with others due to their altruistic behaviors, or due to the expectation of rewards and other recognition gained when they share their knowledge (Brock et al, 2005; Kankanhalli et al, 2005). Altruism has been operationalized as a "perception of pleasure" (e.g. Kankanhalli et al, 2005) whereas, loss of power is considered to be a "fear" (Gray, 2001, Thibaut and Kelley, 1986).

Beaudry and Pinsonneault (2010) provide a framework for classifying emotions based on primary and secondary appraisal within individuals. Factors inhibiting knowledge sharing such as loss of power (Davenport and Prusak, 1998; Orlikowski, 1993), frustration, fear or anxiety, are classified as emotions along the "perceived lack of control" and "Perceived control" continuum in (Beaudry and Pinsonneault, 2010) along the horizontal axis. Their framework is shown in *Figure – 1*.

For example, enjoyment, or pleasure are not under the control of the individual. Emotions on the right of the vertical axis such as fear and anxiety are believed to be emotions over which individuals have control. Therefore, to prevent undesirable consequences, individuals may exhibit resistance when they experience fear or anxiety (Beaudry and Pinsonneault, 2010, pg. 696). Consistent with the emotions perspective, individuals may resist sharing knowledge due to the fear of loss of power or, apprehensions on how favorably (or unfavorably) others would react to the knowledge shared by them. We therefore believe that the emotions included in the framework influence knowledge sharing behavior. Our study focusses on the emotions enjoyment and pleasure on the perceived lack of control side, and fear and anxiety of the having perceived control side along the continuum.

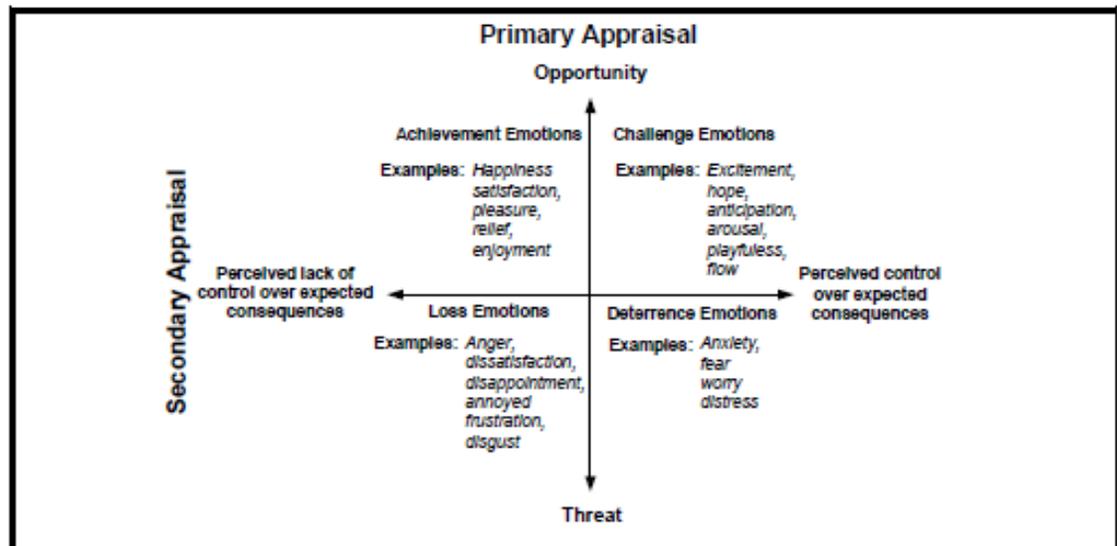


Figure – 1: A framework for classifying emotions
 (Reproduced from: Beaudry and Pinsonneault (2010), pg. 694)

In the IS context, managers or supervisors assemble IS project teams based on the diverse specializations (or expertise) possessed by individuals; since IS tasks are complex

and require knowledge inputs from diverse areas, the coordination of expertise becomes important (Faraj and Sproull, 2000). While this perspective has provided us an understanding that specialization is an important factor for knowledge sharing, and that coordination is required for knowledge sharing; it throws little light on why specialized knowledge is not shared.

Given that prior research has recognized the presence of specialized knowledge among IS/IT professionals, and its importance for Information Systems Development (ISD) activities, it becomes important to test the influence of the presence of specialization on knowledge sharing behavior and the role played by other knowledge sharing factors in facilitating or inhibiting knowledge sharing behavior

While the extant research has focused on examining knowledge sharing behavior using these perspectives, several factors are not yet examined in prior research. Wang and Noe (2010) developed a framework for knowledge sharing research. Their framework (*Figure - 2*) illustrates the various factors believed to influence knowledge sharing behavior. An important contribution of their framework rests in the areas identified as requiring research. The authors also identify several moderating relationships which have not been hitherto examined.

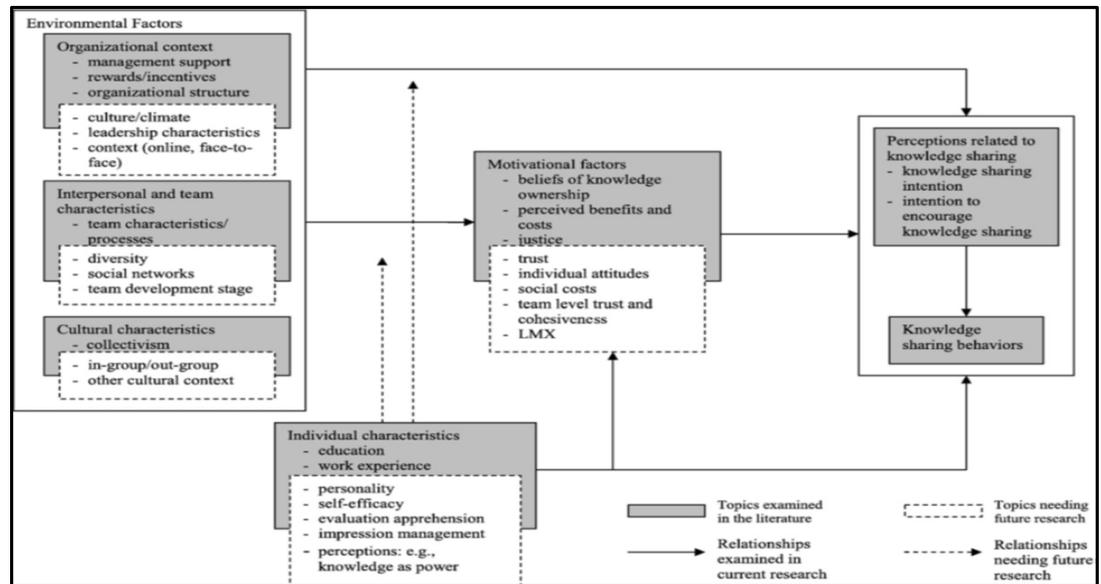


Figure –2: A framework of knowledge sharing research
(Reproduced from: Wang and Noe (2010), pg. 116)

Examining and understanding the moderating effects is important since moderating variables provide a mechanism for influencing knowledge sharing behaviors at the work place. In addition, current research has identified the possibility that moderating effects may have non-linear relationships as well. Holtz and Harold (2013) examined the interaction effect of consideration and structure on counterproductive work behavior and established a curvilinear relationship for the moderation of structure on counterproductive behavior (pg. 511).

While the influence of some variables may not be significant, their effects may still play an important moderating role in determining the influence of other variables therefore examining the role of moderating variables is important. In the context of research on knowledge sharing behavior, it is important to examine the moderating influence of the factors influencing knowledge sharing behavior since the moderation effects of several factors have not been examined in prior research especially, along with the presence of

specialization. Therefore, it is not clear how the numerous factors affect knowledge sharing behavior.

Taken together, we believe that the presence of specialization primarily determines knowledge sharing behavior which, is influenced by several factors from within and external to the individual, and that they may have both direct and indirect effects.

The present research aims to contribute to the existing body of research on knowledge sharing behavior by addressing the broad research question:

What factors affect knowledge sharing behaviors among IS professionals?

More specifically, we develop and test a research model to address the following research questions:

- 1. To what extent do perceptions of fairness influence knowledge sharing behavior?*
- 2. What are the relative effects of the four dimensions of justice on knowledge sharing behavior?*
- 3. To what extent does the presence of specialized knowledge (specialization) influence knowledge sharing behavior?*
- 4. Do factors affecting knowledge sharing behavior moderate the relationship between presence of specialization and knowledge sharing behavior?*

The research questions address important gaps in literature and their investigation should provide a better understanding of knowledge sharing behavior. More specifically, understanding how overall perceptions of justice and fairness influence knowledge sharing behavior is important since, IT professionals' perceptions of justice may perhaps be an important factor determining (or altering) the level of knowledge sharing behavior even though other factors facilitating knowledge sharing behavior may be present within the work environment. In addition, by teasing out the effects of the individual dimensions of justice perceptions on knowledge sharing behavior, this research provides an understanding of which dimensions of justice are relatively important in the context of knowledge sharing behavior. Identifying the dimensions of justice influencing knowledge sharing behavior and identification and assessment of the moderating effects of factors influencing knowledge sharing behavior would help in providing mechanisms for modifying work place practices to enhance knowledge sharing behavior.

This dissertation is organized as follows: We first provide a review of literature related to knowledge sharing behavior and the factors influencing knowledge sharing behavior. Next, we develop a contingency model of knowledge sharing behavior and develop our hypotheses. The research method used for the study and data collection procedures and hypotheses testing are provided next. Finally, we discuss the results of the study, their implications for research and practice and provide directions for future research and conclusions in the last section.

Literature Review

This chapter provides a broad overview of the literature and is organized into five sections. The first section outlines the importance of knowledge sharing in organizations. The second section provides an overview of the literature on equity and the influence of perceptions of equity on knowledge sharing behavior. Section three through five review prior literature on Norms, Work Group Cohesiveness, Evaluation Apprehension and Presence of Specialization from the Transactive Memory Perspective in the context of Knowledge Sharing Behaviors.

Importance of Knowledge Sharing

Knowledge³ management consists of three important processes: knowledge Sharing, knowledge creation and knowledge application. The knowledge sharing process involves conveying tacit or explicit knowledge to other individuals. Knowledge sharing is supported by the socialization and exchange processes. Socialization supports the sharing of tacit knowledge among individuals or groups through communication and interaction, whereas exchange supports the sharing of explicit knowledge (Grant, 1996) which may involve exchanging information through means such as documents, manuals and procedures. Knowledge application represents the reuse of knowledge with or without

³ The term “knowledge” is frequently used interchangeably with data and information though a clear distinction exists between the three. Information and knowledge have been used interchangeably (e.g. Alavi and Leidner, 2001; Earl, 2001; Bartol and Srivastava, 2002) due to its utility in practice as pointed out by Huber (1991). Alavi and Leidner (2001) citing the Tuomi (1999) argue that the raw data does not exist and that the most elementary pieces of data have been influenced by some prior thought or knowledge process (Alavi and Leidner, 2001, pg. 109). Though we acknowledge the divergent views in prior literature, we adopt the distinction that data, information and knowledge are separate in this dissertation.

understanding it to perform the needed tasks (Sabherwal and Sabherwal, 2005). Knowledge creation refers to the development of new knowledge from existing data, knowledge, or information to produce new knowledge (Gold et al., 2001). The importance of these three major processes either in isolation or together as knowledge management has received wide attention in prior research since these three processes are important sources of competitive advantage for organizations.

The dominant stream of knowledge management research in the IS discipline has focused on understanding the phenomena of knowledge sharing; since IS projects are generally complex, and require different and unique knowledge inputs (Patnayakuni et al., 2007) for successful completion. Several studies (Alavi and Leidner, 2001; Teasley et al., 2002; Kankanhalli et al., 2005; Faraj and Sambamurthy 2006; Sharma and Yetton, 2007; Yuan et al., 2009) in knowledge management research have contributed in highlighting the importance of knowledge sharing for organizations.

Equity and its Effects on Individual Behavior

An important stream of research examining the influence of perceptions of fairness stems from the seminal work on Equity Theory by Adams (1963, 1965). Perceptions of fairness are recognized as an important predictor of employee attitude, behaviors (Colquitt and Rodell, 2011), and trust in other members (Pearce et al., 2000). Perceptions of fairness, reflected by four dimensions: procedural justice, distributive justice, interpersonal justice and informational justice have been found to be positively related to several organizational outcomes (Joshi, 1989; Cohen-Charash and Spector, 2001) such as organizational commitment (Martin and Bennett, 1996; Mossholder et al, 1998), task performance

(Konovsky and Cropanzano, 1991; Renn, 1998), citizenship behaviors (Moorman, 1991; Lind and Tyler, 1988; Colquitt 2001) and intentions to share knowledge. Recognizing its importance in organizational contexts, prior IS research has examined the influence of fairness perceptions on individual attitudes and behaviors, including user satisfaction (e.g. Joshi, 1989; Joshi, 1990; Joshi, 1992; Joshi, 2012; Ahuja et. al, 2007) and resistance to implementation (Hunton, 1996, 1997; Joshi, 1991; 2005; Joshi and Lee, 2011).

Procedural Justice

Procedural justice refers to the perceived fairness of decision making with respect to procedures or processes (Thibaut and Walker, 1975; Lind and Tyler, 1988). Two approaches for examining procedural justice in prior literature are as: a) as a process (Thibaut and Walker, 1975) and b) as consistency (Leventhal, 1980). The process approach views perceived fairness of procedures, reflected by the extent to which individuals had control, participation or voice, over the stages involved in decision making. The consistency approach suggests that procedural justice can be achieved when organizations implement procedures that are consistent, free from bias, accurate, correctible, representative of stakeholder interests and ethical (Leventhal, 1980). Perceptions of procedural justice are considered to be important in organizational contexts due to their effect on organizational outcomes. When the outcomes of organizational processes or procedures are perceived to be unfair employees have been found to indulge in counter productive work behaviors such as withholding performance in order to restore imbalances in equity (Brockner and Wiesenfeld, 1996; Konovsky and Cropanzano, 1991).

The effects of procedural justice on several organizational outcomes have been examined in prior research. Among the desirable organizational outcomes examined in prior literature, Folger and Konovsky (1989) examined the effects of procedural justice and distributive justice among 217 employees on decisions about pay raises and found that procedural justice was related to trust in supervisor and organizational commitment. Tepper and Taylor (2003) examined the effects of supervisor and subordinates' perceptions of procedural justice among 317 National Guards and found that supervisors perceptions of procedural justice was positively related to supervisors extra role behaviors such as mentoring behavior which in turn, positively influenced subordinates' perceptions of procedural justice and consequently subordinates' organizational citizenship behaviors.

Perceptions of procedural justice were found to be high among promotees than those who were passed over for promotions (Schwarzwald et al, 1992). Lam and Schaubroeck (2000) conducted a longitudinal study among bank teller employees and found that employees experiencing high internal locus of control, measured using perceptions of control on their effort outcomes on the job (promotions), were positively related to job involvement, job satisfaction and organizational commitment across two time periods.

Low levels of procedural justice have been linked to undesirable organizational outcomes such as absenteeism and turnover intentions in prior research (e.g. Masterson et al, 2000). Ahuja et al (2007) found strong evidence for the effects of fairness of rewards on turnover intentions through organizational commitment. Perceptions of fairness consisting of measures of process, practices and procedures used in reward structures were

positively related to organizational commitment and, organizational commitment was negatively related to turnover intentions. Perceptions of justice have been found to influence absenteeism in Lam and Schaubroeck (2000).

When managers used fair practices and explained the reasons and conditions for resource allocations and layoffs to subordinates, their turnover intentions were found to be lower (Brockner et al, 1990) reflecting the influence of procedural justice and its relationship with turnover intentions. Perceptions of organizational politics representing a “lack of control” (Ferris et al, 1992, pg. 95) over processes were related to organizational withdrawal. Organizational withdrawal can be expected to be higher when employees have alternative opportunities. Employees lacking alternative opportunities exhibit increased absenteeism whereas those with alternative opportunities leave the organization representing turnover (Ferris et al, 1992).

In the IS context, Hunton has examined the influence of procedural justice operationalized as “*voice and choice*” in the system design decision on user acceptance behaviors (Hunton, 1996, 1997). The study found significant gains in performance when users believed they were involved in the development of a new IS indicating that procedural justice was related to improved performance. In the context of knowledge sharing, procedural justice has been found to reduce counterproductive work behaviors and shaping norms (Holtz and Harold, 2013), which have been found to be positively related to knowledge sharing behavior.

Distributive Justice

Distributive justice refers to the fairness of decision outcomes based on individual perceptions of whether the ratio of one's contributions or inputs, and outcomes match those of other individuals by comparison (Adams, 1965). Though it is not possible in reality to accurately measure inputs or outcomes objectively, Adams (1965) acknowledges an element of subjectivity in the assessment of distributive justice. In the organizational context, when workers compare their contributions, performance and other inputs to their referent others in the organization with the resources and rewards they received or may receive, evaluations of distributive justice are made. When perceptions of distributive justice are fair, employees are more likely react in a positive manner, and become dissatisfied and de-motivated when evaluations are perceived to be unfair (Greenberg, 1987).

Distributive justice has been examined in prior research and has been found to be positively associated with organizational commitment (Roberts et al, 1999). Dubinky and Levy (1989) found that fairness in distributing tasks, pay rules and pay levels, was positively associated with organizational commitment and job satisfaction among 238 sales personnel. Hill (1998) conducted a study involving respondents to a National Employment Survey in the US and found a strong correlation between distributive justice and benefits satisfaction and both distributive justice and benefits satisfaction significantly influenced job satisfaction.

The relationship between distributive justice and trust has been supported in prior research (Pearce et al., 2000). When individuals compare themselves with others,

perceptions of distributive justice evoke feelings of trust due to the comparisons of treatment meted out to them in terms of resources and opportunities provided, and perceptions of decisions made with respect to such allocations within the organization, when perceived to be unfavorable, evoke feelings of distrust and vice versa (Saunders and Thornhill, 2003). Organizational commitment and trust in co-workers were found to be significantly related to tacit knowledge sharing by Chieh-Ping (2007).

Perceptions of fairness in understanding the effects of IT charge backs and investments in IT were reported by Ross et al (1999). The authors found that rather than costs considerations or charge back characteristics, clear communication and an understanding of the fairness in allocating charge back costs resulted in favorable perceptions of IT investments and promoted partnerships with other business units in a qualitative study among nine US firms and one Australian firm. In a supplier-distributor context among 3225 firms, distributive justice was found to be positively associated with relational behaviors consisting of sharing of information, and was found to encourage, or promote a cooperative environment in inter-organizational contexts (Griffith et al, 2006) indicating the importance of distributive justice in the context of knowledge sharing and transfer through socialization and exchange processes (Grant, 1996).

Informational Justice and Interpersonal Justice

Interpersonal justice and Informational justice are distinct constructs derived from the concept of interactional justice. Prior literature has found interactional justice, a concept related to the quality of treatment received by subordinates from their supervisors to influence several organizational outcomes (Bies and Moag, 1986). Greenberg (1990, 1993)

proposed the two dimensional nature of the construct. While informational justice captures individuals' perceptions of fairness related to the extent of information and explanations provided by supervisors for the basis of their decisions, interpersonal justice was related to individuals' perceptions of whether subordinates were treated with politeness, respect and dignity by their supervisors (Greenberg, 1990, 1993). Empirical evidence for these two dimensions as distinct yet interrelated constructs was found by several researchers (Colquitt, 2001; Colquitt et al, 2001; Colquitt and Shaw, 2005).

Informational justice and interpersonal justice have been examined in prior research and have been found to be positively associated with trust, benevolence and integrity (Colquitt and Rodell, 2011). Trust in turn has been found to influence several concepts related to knowledge related outcomes. The information processing effects of social capital in IS projects been implied in prior literature include trust as an important antecedent of knowledge outcomes. Social capital, an important antecedent of intellectual capital resulting in the creation of new knowledge through exchange and combination processes (Nahapiet and Ghoshal, 1998) and social capital can be managed by increasing levels of trust, reciprocity, communication and other relational aspects (Turner and Makhija, 2006; Sabherwal, 2007; Kirsch et al 2010) in social exchanges.

Knowledge sharing is supported by socialization and exchange processes. Socialization supports the sharing of tacit knowledge among individuals or groups through communication and interaction whereas exchange supports the sharing of explicit knowledge (Grant, 1996). Low levels of perceived informational justice and interpersonal justice therefore may restrict the extent of social exchanges, contributing to what Szulanski

(1996) terms “internal stickiness,” an important barrier for sharing knowledge. Colquitt (2011) emphasizes the importance of these two factors by relating them to “exchange currency” in social exchanges.

In the context of IS projects, interpersonal justice and informational justice are important since, teams are assembled and disbanded based on the expertise required for project task completion (Faraj and Sproull, 2000), where sufficient time may not be available for nurturing relationships and developing high levels of trust. We therefore believe that all our justice factors are likely to affect knowledge sharing among IT professionals.

Norms and Knowledge Sharing Behaviors

Nahapiet and Ghoshal (1998) defined social capital as: “*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*” (Nahapiet and Ghoshal, 1998, pg. 243). The three dimensions of social capital identified by them are: structural, cognitive and relational and consists of organizational features such as networks, associations, interpersonal trust, norms and reciprocity for mutual benefit (Bourdieu, 1986; Coleman, 1990; Putnam, 1995). Of importance to this study are factors from the relational dimension such as trust and norms in enabling social capital in facilitating collective action (Lochner et al., 1999) through information and knowledge flows, enhancing “collective efficiency” (North, 1990) in work groups. These features serve in making resources such as information and opportunities available to individuals through other individuals, which otherwise may not have been available.

Social capital has been found to influence knowledge integration in digital teams (Robert et al., 2008), knowledge creation (Smith et al., 2005), knowledge sharing in virtual communities (Chiu et al., 2006), knowledge contribution in electronic networks (Wasko and Faraj, 2005), open source software development (Scacchi, 2007), IT career transitions (Reich and Kaarst-Brown, 2003) and outsourced IS development projects (Okoli and Wonseok, 2007).

Work Group Cohesiveness and Knowledge Sharing

According to the social identity theory, people classify themselves into groups along with others based on various characteristics such as race, gender etc. (Ashforth and Mael, 1989; Tajfel and Turner, 1979). The context provides a basis for the dominant identity invoked and enactment of behaviors and provides a basis of belonging, and sharing of the outcomes the group experiences (Mael and Ashforth, 1992, pg. 105).

Nahapiet and Ghoshal (1998) included identification as an aspect of the relational dimension of social capital (pg. 244). The authors believe that salient group identification maybe beneficial in the creation of intellectual capital (pg. 256). However, research based on social identity theory has emphasized the importance of contextual conditions, which provide a basis for triggering the identification process within individuals indicating its dynamic nature (Ashforth and Mael, 1989; Tajfel and Turner, 1985; Brewer and Gardner, 1996; Brickson, 2000). The activation of identity triggers cognitive processes (Tajfel, 2010, 1969) and motivational mechanisms (Turner, 1982) within the individual altering the

identity salience (cf. Brickson, 2000, pg. 83). The troublesome nature of identity salience arises due to the fact that being a cognitive process, it is not possible to identify or measure which identity is invoked or, is dominant in a particular context.

Riordan and Weatherly (1999) suggest that while work group identification forms the cognitive connection, other concepts such as work group cohesiveness and work group communication are the interpersonal and task related relationships that members share which trigger a sense of belonging and attraction to other members resulting in work group cohesiveness. The concept of work group cohesiveness is based on the theory of group cohesiveness proposed by Festinger et al (1950), which defines cohesiveness as the degree to which an individual is attracted towards other individuals or groups where, the attraction among members develops due to mutual positive feelings towards each other.

Prior IS research has not examined the possibility that work group cohesiveness influences knowledge sharing among IT professionals. Moreover, when considered in the context of equity perceptions in work groups, we believe that perceptions of unfair treatment meted to members would affect work group cohesiveness and other relational aspects such as reciprocal behaviors, trust and effective sharing of social norms adversely affecting knowledge sharing. Recognizing the implications of the above argument, we believe that work group cohesiveness is an important determinant of knowledge sharing behavior.

Evaluation Apprehension

Two opposing arguments, and theoretical perspectives, have been proposed by researchers in the context of productivity in work groups. Osborn (1957) believed brainstorming was a better method for solving problems in groups since members can contribute more number of ideas and, the quality of such ideas can be improved through mutual discussions. Researchers addressing productivity losses in groups however believe that factors such as free riding (e.g. Latane et al, 1979), production blocking (e.g. Lamm and Trommsdorff, 1973), shyness (Pilkonis, 1977) and evaluation apprehension (e.g. Anderson, 1969; Diehl and Stroebe 1987) are important factors which reduce the productivity of work groups. Watson and Friend (1969) defined Fear of negative evaluation (FNE) as *“apprehension about others’ evaluations, distress over their negative evaluations, and the expectation that others would evaluate one-self negatively.”* (Watson and Friend, 1969, pg. 449)

In the context of knowledge sharing, members are aware that teams are assembled and disbanded based on the expertise required for project task completion (Faraj and Sproull, 2000). In the presence of new members, and uncertainties in new IS projects, productivity loss factors identified above are most likely to affect knowledge sharing among IT professionals. Prior research has not examined the effect of evaluation apprehension, an emotion arising due to fear of negative evaluation on knowledge sharing behavior.

Presence of Specialization and Transactive Memory Systems

Knowledge residing in multiple locations needs to be accessed by individuals to complete various tasks. Knowledge that is explicit and residing in repositories, knowledge bases, documents and manuals can be accessed relatively easily compared to the knowledge residing within an individual's mind. Knowledge that is residing within individuals must be either voluntarily shared or, other individuals may request for knowledge from those who possess it.

The Transactive Memory Systems theory seeks to explain how individuals locate and access the unique, different knowledge stored in other individuals. Transactive Memory is a property of the group (Wegner, 1987, pg. 191), reflecting the group mind, consisting of the knowledge of all members within the group. Individuals acquire knowledge in different areas consequently the knowledge possessed by a group of individuals would be different and unique. The knowledge held by other members of a group serves as an external memory for individuals within the group which, can be accessed through communications and interactions (Wegner, 1987; Wegner et al., 1991).

Transactive memory systems operate through three processes: encoding, storage and retrieval. In the encoding process, individuals collect information on various aspects of interest to them. This collection of information may be internal i.e. entered into their respective memories or, encoded externally e.g. asking someone to write down a phone number (Wegner, 1987, pg. 190). The storage process involves retaining the information encoded for future use. The storage process may involve associating the new information encoded with other information already existing in the mind or externally, to yield

information or knowledge that is of higher value. The retrieval process consists of accessing the information held in other locations i.e. external to the individual through communication and interaction (Wegner, 1987, 1995).

A Transactive System is formed when individuals learn about the expertise of other members in the group based on visual cues, conversations and assumptions based on knowing the prior activities or, the profession of other individuals (Wegner, 1987, Hollingshead, 1998). Knowing about other members' expertise in the group is enabled by the process of directory updating (Wegner, 1995; Hollingshead, 1998) where, information about the expertise about multiple individuals serves as a directory which individuals update based on new information received about the members. When individuals receive new knowledge or information related to a particular event or activity, they may encode it and store it within their memory or, communicate the knowledge or information to other individuals they perceive as experts in the area or, information allocation takes place (Hollingshead, 1998; Wegner, 1995) to the necessary individuals. Information retrieval involves the search individuals' conduct within their memories, and sharing it with other members' unique or different knowledge to make decisions or accomplish tasks (Brandon and Hollingshead, 2004; Lewis, 2003).

In the context of knowledge sharing in IS projects, members within a team may be allocated work based on specific components or tasks, required to complete the project. Information or knowledge related to the tasks are conveyed or, directed to the members based on the task or project components they work upon. The individual project components are developed or assembled into a final product e.g. a module or an entire

software application (Austin, 2003). The activities involve recognizing or knowing the specializations of both, oneself and other members in the team, which the team trusts, assigning credibility and coordination of tasks and related knowledge (Faraj and Sproull, 2000) required for the completion of either the individual tasks or the overall project. Transactive memory therefore plays an important role in knowledge sharing by determining the presence of specialization within and among individuals. The importance of the role of Transactive memory systems in IS projects is further enhanced by the fact that IS projects may be outsourced and the tasks may be accomplished with a hybrid organizational structure consisting of both co-located and globally distributed teams (Oshri et al., 2008) or virtual teams (Kanawattanachai and Yoo, 2007).

Research Design

This study advances the Contingency Theory perspective to understand factors influencing knowledge sharing behaviors of IT professionals by drawing upon concepts from the theories of equity, social capital, group cohesiveness, social identity and knowledge based theory of the firm in attempting to integrate prior literature on knowledge sharing behaviors among IS professionals. The rationale and justification for advancing a contingency perspective for understanding knowledge sharing behaviors arises from the fact that numerous theories used in prior research have eluded a comprehensive understanding of the phenomena and may have ignored important factors related to the phenomena and the context within which it occurs.

Equity Theory (Adams, 1963, 1965) suggests that perceptions of fairness are an important predictor of employee attitudes and behaviors. In organizations equity perceptions are determined by the factors related to procedural, distributive, interpersonal and informational justice. (Colquitt and Rodell, 2011; Pearce et al., 1994). An inseparable part of human behavior stems from emotional responses and emotions influence human behavior (Zuboff, 1988) due to cognitive appraisal processes occurring within individuals (Han et al, 2007; Lerner and Keltner, 2000) determining behavior (Zuboff, 1988). It is however not clear, how emotions influence knowledge sharing behaviors, given a particular context.

Social Capital theory indicates that knowledge embedded within networks and relationships among individual actors is shared and utilized to create new knowledge, through exchange and combination processes (Nahapiet and Ghoshal, 1998; Subramaniam

and Youndt, 2005). The theory of group cohesiveness provides an overarching explanation of how personal identities, social, task and emotional aspects come together, based on the context, to form and sustain bonds among work group members which are used for task accomplishment.

The Social Identity theory utilizes “self” concepts consisting of personal identities, skills and abilities, through which individuals psychologically locate, or identify themselves, within multiple group classifications based on the context resulting in sharing of the outcomes the group experiences (Mael and Ashforth, 1992, pg. 105; Ashforth and Mael, 1989; Tajfel and Turner, 1985; Brewer and Gardner, 1996; Brickson, 2000). Nahapiet and Ghoshal (1998) included identification as an aspect of the relational dimension of social capital (pg. 244). Other interpersonal factors influencing group environments are norms, values and culture prevalent among members of the group. Finally, the knowledge based theory of the firm proposes that the firm is a “dynamic, quasi-autonomous system” where numerous factors simultaneously interact in the sharing and production of knowledge (Spender, 1996).

Including the insights provided by these theories we develop a research model (*Figure 3*) to integrate the concepts identified from the above theories to understand knowledge sharing behavior and define the key constructs (*Table 1*) in support of our argument that knowledge sharing behaviors among IS professionals are contingent upon several interrelated factors arising from within and external to the individual.

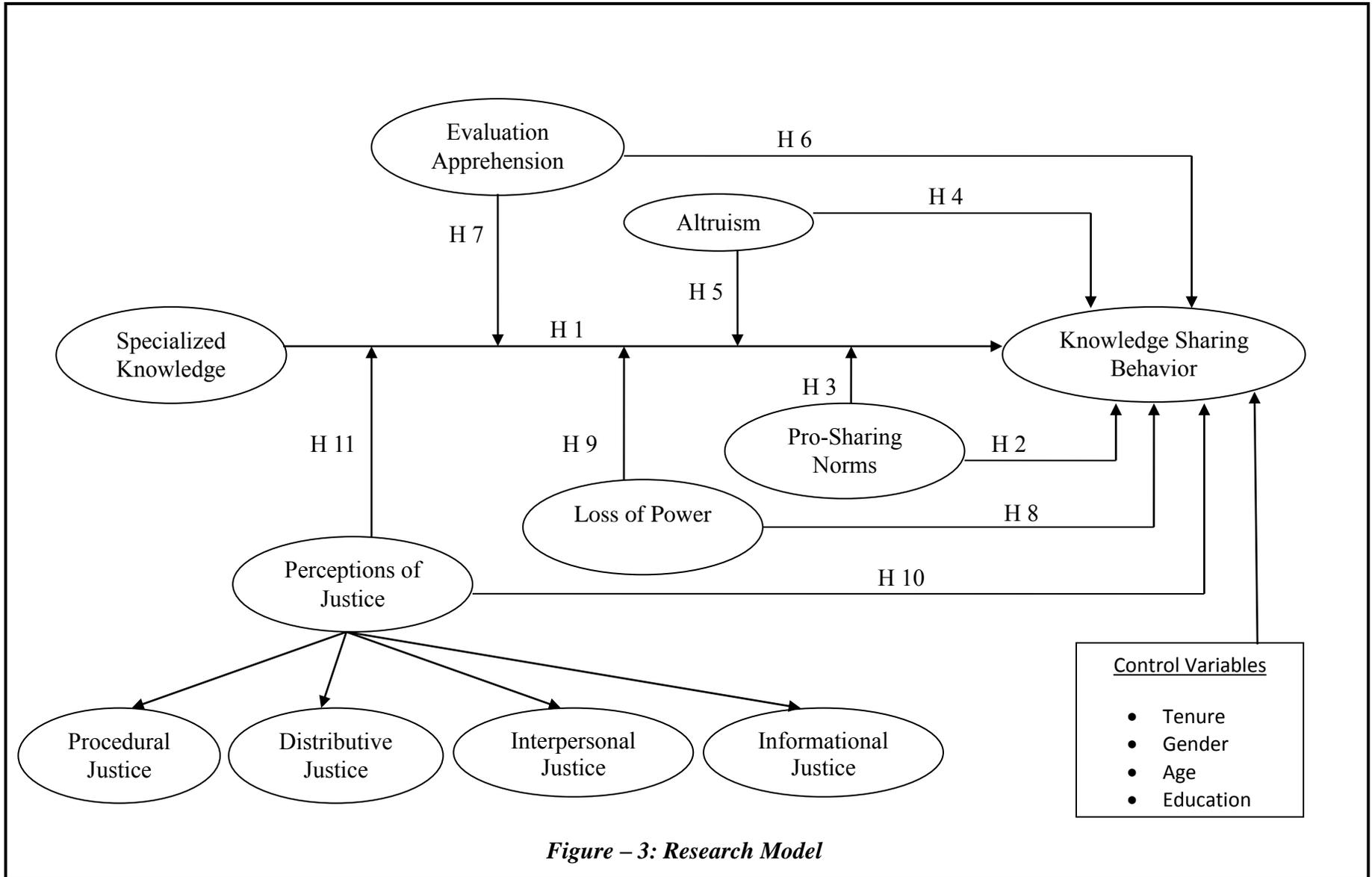


Figure – 3: Research Model

Table 1: Definitions of Constructs	
Construct	Definition
<i>Knowledge sharing behavior</i>	<i>The sharing or contribution of an individual's knowledge with other members within his/her primary work group (Based on Bock et al, 2005)</i>
<i>Presence of Specialization</i>	<i>An individual's perception of his/her ability to provide unique knowledge and/or skills of value to other members in their primary work group with respect to Information Systems Development (ISD) activities. (Based on Faraj and Sproull, 2000, Lewis 2003, Kankanhalli et al, 2005)</i>
<i>Perceptions of fairness</i>	<i>An individual's perceptions of fairness or justice with respected to other referent members in his/her primary work group. (Based on Joshi, 1989)</i>
<i>Procedural justice</i>	<i>An Individual's perceptions of fairness of decision making procedures within his/her primary work group. (Based on Colquitt and Rodell, 2011, pg. 1183)</i>
<i>Distributive justice</i>	<i>An Individual's perceptions of fairness of decision outcomes within his/her primary work group. (Based on Colquitt and Rodell, 2011, pg. 1183)</i>
<i>Informational Justice</i>	<i>An individual's perception of the degree of justification and truthfulness offered during procedures within his/her primary work group. (Based on Colquitt and Rodell, 2011, pg. 1183)</i>
<i>Interpersonal justice</i>	<i>An Individual's perceptions of fairness about the degree of respect and appropriateness by other members in the primary work group towards him/her. (Based on Colquitt and Rodell, 2011, pg. 1183)</i>

Construct	Definition
<i>Loss of Power</i>	<i>The perception of power and unique value lost due to knowledge contributed (Based on Kankanhalli et al, 2005, Gray, 2001)</i>
<i>Work group cohesiveness</i>	<i>“The degree to which individuals believe that the members of their primary work groups are attracted to each other, willing to work together, and committed to the completion of the tasks and goals of the primary work group.” (Riordan and Weatherly, 1999, pg. 312)</i>
<i>Pro sharing norms</i>	<i>“The prevalence of norms that are intended to facilitate knowledge sharing in the primary work group.” (Kankanhalli et al, 2005, pg.123)</i>
<i>Evaluation apprehension</i>	<i>An individual’s fear of being evaluated unfavorably by other members within his/her primary work group” (Based on Leary, 1983)</i>
<i>Altruism</i>	<i>An individual’s perception of pleasure obtained from helping others within his/her primary work group by sharing knowledge, information or skills. (Based on Kankanhalli et al, 2005)</i>

Hypothesis Development

Presence of Specialization and Knowledge Sharing Behavior

The presence of specialized knowledge, or expertise, has been recognized as a pre-requisite condition for sharing knowledge (Wasko and Faraj, 2005). Since individuals acquire knowledge in different areas, the knowledge possessed by a group of individuals would be different and unique. Managers in IT organizations recruit members possessing a variety of expertise and co-ordinate the expertise of members for successful completion of tasks (Faraj and Sproull, 2000).

Apart from formal means of coordinating expertise, individuals in workgroups share information on the specializations possessed by them; reflecting the group mind, consisting of the knowledge of all members within the group. Prior literature from the Transactive Memory System stream of research states that individuals are able to evaluate whether the specialization possessed by them is unique compared to others' knowledge within the group through the processes of encoding, storage and retrieval (Wegner, 1987; Wegner et al., 1991). Such evaluations afford individuals an assessment and belief of whether they possess specialized knowledge which may be of some value when shared with other members within the workgroup.

If the evaluations from cognitive appraisal processes indicate that little, or no value, may be derived by other members in the group when the knowledge possessed by them is shared; then, the presence of specialization possessed in that area is low. Therefore individuals would be less inclined to share knowledge pertaining to that area. On the

contrary, if individuals believe that the knowledge possessed by them is valuable to others, the potential for sharing knowledge is higher. We therefore believe that the level of the presence of specialization primarily determines whether individuals share knowledge. Accordingly, we hypothesize as follows:

Hypothesis 1: *The presence of specialization is positively related to knowledge sharing behavior.*

Pro-Sharing Norms and Knowledge Sharing Behavior

Norms represent the unwritten rules or, expected patterns of consensual, or confirmative behaviors, among members of a social system; leading to cooperative behaviors (Coleman, 1990; Nahapiet and Ghoshal, 1998) when individuals in a collective, or group, share common goals (Ouchi, 1980), values, commitment and ideologies (Boland, 1979; Ouchi, 1979; Orlikowski, 1991). Pro-sharing norms represent *the prevalence of norms that are intended to facilitate knowledge sharing in the primary work group.*” (Kankanhalli et al, 2005, pg.123). Nahapiet and Ghoshal (1998) identify norms as an aspect of the relational dimension of social capital which facilitates the development of intellectual capital through knowledge sharing supported by the exchange and combination processes.

Work groups experiencing high levels of social capital, through shared norms, cognitive models, and trust gain an awareness of the locus of knowledge and skills required for task completion. Shared mental models influence coordination and enable *“knowledge convergence on various team processes and performance”* (Mohammed and Dumville,

2001, pg. 93) and predict normative behaviors. Norms have been found to influence knowledge sharing behavior either directly or, indirectly through their influence on social capital. Kanakanhalli et al (2005) found that reciprocity and pro-social norms together influenced contribution to Electronic Knowledge Repositories (EKRs).

Social capital has been found to influence knowledge integration in digital teams (Robert et al., 2008) and in fostering a collaborative culture (a normative behavior) which facilitates the sharing of ideas with other members in teams. Gopal and Gosain (2010) examined the effect of collaborative culture on software quality and project efficiency in 96 IS projects and found that collaborative culture enhanced the quality of software produced, but reduced project efficiency by displaying a collectivist attitude. Norms were also found to influence conflict resolution and support boundary-spanner roles (Gittell, 2000), and enhance information processing capabilities in organizations (Collins and Clark, 2003). We therefore believe that pro-sharing norms among IT professionals positively influence knowledge sharing. Accordingly, we hypothesize as follows:

Hypothesis 2: *Pro sharing norms in work groups and individual knowledge sharing behavior are positively related.*

Prior literature examining the relationship between social capital and IS project outcomes has found that organizations utilize relational mechanisms such as socialization and training programs in managing IS projects, which provide opportunities for communication and interaction among work group members (Kirsch, 1997). However, not all individuals are expected to interact uniformly with other members in the group. The varying levels of interaction and communication accordingly influence the sharing norms

and consequently, varying levels of knowledge sharing behaviors are expected based on the extent to which members subscribe to the normative behaviors and culture of the work group. We therefore believe that pro-sharing norms have a moderating influence on the presence of specialized knowledge and knowledge sharing behavior; in addition to the direct effect on knowledge sharing behavior. We therefore hypothesize that:

Hypothesis 3: *Increasing (decreasing) levels of pro sharing norms in organizations strengthen (weaken) the relationship between specialization and knowledge sharing behavior.*

Altruism and Knowledge Sharing Behavior

Altruism refers to the degree of concern for the welfare of others compared to the self (Hsu and Lin, 2008). Evidences of altruistic behavior have been found in prior research where individuals contribute their efforts for the benefit of others without expecting anything in return. Research on emergent groups, where individuals come together at random (e.g. during disasters and natural calamities) have been found to share information, knowledge and coordinate work to help others in need (Majchrzak et al., 2007). Individuals may share their expertise due to altruism, i.e., they are intrinsically motivated and enjoy helping others without expecting anything in return (Krebs, 1975; Smith, 1981). Motivation is a necessary condition for the exchange and combination processes which support knowledge sharing and the creation of intellectual capital (Ghoshal and Moran, 1996; Nahapiet and Ghoshal, 1998). IS professionals experiencing high levels of motivation may share their experiences and knowledge, through conversations, narratives and metaphors (Grant, 1996; Nonaka, 1994) promoting knowledge sharing through

“knowledge donation” and *“knowledge collection”* activities (Van Den Hooff and Leeuwvan Weenen, 2004, pg. 13).

A positive relationship between intrinsic motivation and knowledge sharing has been found in prior research (Ba et al, 2001; Osterloh and Frey, 2000; Wasko and Faraj, 2000) and Kankanhalli et al (2005) found support for their hypotheses that enjoyment in helping others was positively related to knowledge contribution in Electronic Knowledge Repositories (EKRs). We therefore hypothesize that:

Hypothesis 4: *Individual Altruism and knowledge sharing behavior are positively related.*

Individual level literature on motivation has observed behaviors of individuals as an interaction of individual traits and situations (e.g. Maehr and Braskamp, 1986) and researchers studying intrinsic motivation have argued that intrinsic motivation is an internal process whose state, changes continuously, due to changes in the environment and the perceived internal feedback individuals experience within themselves (Schunk et al., 2008), i.e., behaviors arising from intrinsic factors are dynamic in nature and, the effect of other factors in the environment influence their levels in individuals, which in turn, direct resource allocation and efforts towards the goal. We therefore hypothesize that altruism also moderates the relationship between the presence of specialized knowledge and knowledge sharing behavior.

Hypothesis 5: *The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of high (low) altruism in individuals.*

Evaluation Apprehension and Knowledge Sharing Behavior

Fear of negative evaluation (FNE) or evaluation apprehension represents "*the degree to which people experience apprehension at the prospect of being evaluated negatively*" (Leary, 1983, pg. 371) and is considered to be an important determinant of individual behavior in social situations. Fear of negative evaluation within individuals has been found to increase ambiguity aversion (Trautmann et al, 2008) wherein individuals prefer to undertake known risks rather than unknown ones.

Osborn (1957) believed brainstorming was a better method for solving problems in groups since members can contribute more ideas and, the quality of such ideas can be improved through mutual discussions. However, theories addressing productivity losses in groups believe that free riding, production blocking and evaluation apprehension reduce the productivity in work groups. Other researchers believe that members in groups share only their common or, shared knowledge, and not their expertise; thereby reducing the productivity in groups, due to the fear of negative evaluation (Diehl and Stroebe 1987; Karau and Williams 1993).

To test for the effects of evaluation apprehension, Anderson (1969) conducted four experiments and found support for their hypotheses that the quality and quantity of ideas produced and shared were higher in their no-experts condition where group members were

told that there were no experts in the group, compared to the one-expert and all-expert condition. In further support of their hypotheses participants in the expert conditions indicated that evaluation apprehension produced inhibition towards knowledge sharing, through their responses to post-experimental questionnaires.

In the IT work group context, members are aware that teams are assembled and disbanded based on the expertise required for project task completion (Faraj and Sproull, 2000). In the presence of other members, some of whom maybe new to the work group; individual perceptions of “others as experts” is most likely to induce evaluation apprehension within individuals since, they are not sure how their ideas or contributions may be received, therefore, IT professionals may adopt a cautious approach to sharing ideas or unique knowledge within their work groups. We therefore hypothesize that:

Hypothesis 6: *Evaluation apprehension in individuals is negatively related to knowledge sharing behavior.*

The findings from experiments conducted by Anderson (1969) and the literature on Transactive Memory Systems provide ample indications of a constant assessment of the expert status of the self-versus-others in knowledge sharing situations. In situations where insufficient cues are available for group members to assess the expert status of others or, based on the tenure in the workgroup, members may share varying levels of norms and mental models which may produce varying levels of evaluation apprehension (Diehl and Stroebe 1987; Karau and Williams 1993).

Individuals with higher emotion regulation capabilities are able to better manage their reactions in situations where anxiety influences behavior (Schutte al, 2002), therefore, varying levels of evaluation apprehension among members of the group are expected to influence knowledge sharing behaviors. Accordingly, we hypothesize that a moderating influence between the presence of specialization and evaluation apprehension exists. Therefore,

Hypothesis 7: *The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of low (high) evaluation apprehension in individuals.*

Loss of Power and Knowledge Sharing Behavior

Knowledge is considered to be a source of power (Gupta and Govindarajan, 2000) and when shared with others, individuals may perceive that their importance among referent others may be reduced due to the loss their expertise. Husted and Michailova (2002) believe that individuals possessing specialized knowledge derive tangible benefits within their organizations such as bonuses and promotions (Wang and Noe, 2010). Consequently, sharing such expertise may result in reduced benefits and importance. Prior literature has found that loss of power is an important barrier for knowledge sharing (Orlikowski, 1993; Davenport and Prusak, 1998). Consistent with the view held in prior literature, we believe that high perceptions of loss of power result in low knowledge sharing behavior. We therefore hypothesize that:

Hypothesis 8: *Loss of power and knowledge sharing behavior are negatively related.*

Since individuals possessing specialized knowledge may experience loss of power when they share their knowledge, we believe that perceptions of loss of power moderates the relationship between presence of specialization and knowledge sharing behavior. Therefore, increasing levels of loss of power dampen the strength of the relationship between presence of specialization and knowledge sharing behavior whereas, lower perceptions of loss of power would strengthen the effect of the relationship between presence of specialization and knowledge sharing behavior. We therefore hypothesize that:

Hypothesis 9: *The relationship between the presence of specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of low (high) perceptions of loss of power.*

Justice Perceptions and Knowledge Sharing Behavior

Perceptions of justice are considered to be important in work groups due to their effects on outcomes. Group members' justice perceptions have been found to foster mutual trust and organizational commitment (Konovsky, 1989); which are strong predictors of knowledge sharing behavior among IS professionals (Wang and Noe, 2010; Sabherwal, 2007).

Justice perceptions have also been found to be influence extra role behaviors (Tepper and Taylor, 2003) among superiors and their co-workers. Altruism and pro-sharing norms are well researched extra role behaviors, which cannot be mandated or effectively enforced by organizations. Both altruism and pro-sharing norms are extra role behaviors, which have received consist support in prior literature, for their positive influence on

knowledge sharing behavior (Wang and Noe, 2010) and since perceptions of justice influence extra role behaviors in organizations, it is expected that the perceptions of justice influence individuals' behavior towards sharing knowledge.

Lam and Schaubroeck (2000) found evidence for the positive relationship between perceptions of justice, job involvement, and organizational commitment. Individuals who identify with their workgroups or organizations display high levels of organizational commitment. The theoretical relationship between identification and knowledge sharing behaviors is well established in prior IS research (Coleman, 1990; Kameda et al., 1997). On the other hand, unfavorable perceptions of justice produce counter productive work behaviors in order to restore imbalances in equity (Brockner and Wiesenfeld, 1996; Konovsky and Cropanzano, 1991). We therefore, believe that knowledge sharing behaviors are directly influenced by perceptions of justice and that perceptions of justice moderate the relationship between presence of knowledge and knowledge sharing behavior. Accordingly, we hypothesize as follows:

Hypothesis 10: *High perceptions of justice will the increase knowledge sharing behavior in individuals.*

Hypothesis 11: *The relationship between specialization and knowledge sharing behavior will be weakened (strengthened) under the influence of low (high) perceptions of justice in individuals.*

Work Group Cohesiveness and Knowledge Sharing Behavior

Riordan and Weatherly (1999) identified work group cohesiveness and work group communication to be the interpersonal and task related relationships that members share among each other. Work group cohesiveness affects the ability of group members' willingness to work together and solve task related problems through communications and interactions.

Knowledge sharing is supported by the exchange and combination processes and conversations and interactions are important mechanisms for disseminating information or knowledge (Brown and Duguid, 2001; Davenport and Prusak, 1998). Therefore, changes in work group cohesiveness affect knowledge sharing behavior through work group communication by altering the extent of information (or knowledge) passed on among and between members of the work group (Hall, 1982; Price and Mueller, 1986; Tannenbaum, 1968).

Work groups with higher levels of cohesion were found to experience higher levels of trust and were able to better coordinate work due to low inter-member friction (Dobbins and Zaccaro, 1986). The positive influence of work group cohesiveness on knowledge sharing behavior has been examined and found to be consistent at the team level by Woerkom and Sanders (2010), who found support for their hypothesized positive relationship between cohesiveness and exchange of advice (knowledge sharing) among 1354 individuals working in 126 teams.

In the IT organizational context, organizations deploy and frequently restructure available resources to optimize performance (Straub et al., 2008, pg. 198) by forming and disbanding work groups by attracting members possessing expertise required for the completion of projects (Faraj and Sproull, 2000). The restructuring of resources, however, alters network ties and configurations among work group members by altering stable network characteristics such as dense relations (or work group cohesiveness) which limit the extent of interactions (Sabherwal, 2007) and shared experiences among work group members, making it difficult to share each other's thinking processes (Nonaka, 1994), mental models, identifications (Merton, 1968) and norms, (Starbuck, 1992) all of which have been found to influence the extent of knowledge sharing among group members. We therefore hypothesize that:

Hypothesis 12: *Work group cohesiveness and knowledge sharing behavior are positively related.*

Relationships among work group members are important for coordinating work (Adler et al, 2008; Faraj and Sproull, 2000) and completing complex, interdependent and uncertain tasks (Gittell et al, 2010). Prior research has found that relational aspects among work group members facilitate participation and cooperation (Kankanhalli et al., 2005). Work groups experiencing high levels of cohesiveness and communication, shared norms, cognitive models and trust gain an awareness of the locus of knowledge and skills required for task completion and, shared mental models influence “knowledge convergence on various team processes and performance” (Mohammed and Dumville, 2001, pg. 93); predicting group member actions. Fluctuating levels of work group cohesiveness therefore,

are expected to affect group members' understanding of the locus and, convergence of knowledge. Therefore, in addition to having direct effects on knowledge sharing behavior, work group cohesiveness is expected to moderate the influence of the presence of specialized knowledge on knowledge sharing behavior. We therefore hypothesize that:

Hypothesis 13: *The relationship between the presence of specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of high (low) work group cohesiveness.*

Table – 2, lists the hypothesized relationships.

Table 2: List of Hypotheses

Hypothesis	Hypothesized Relationship
H 1	<i>The presence of specialization is positively related to knowledge sharing behavior.</i>
H 2	<i>Pro sharing norms in organizations and individual knowledge sharing behavior are positively related.</i>
H 3	<i>Increasing (decreasing) levels of pro sharing norms in organizations strengthen (weaken) the relationship between specialization and knowledge sharing behavior.</i>
H 4	<i>Individual Altruism and knowledge sharing behavior are positively related.</i>
H 5	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of (low) high altruism in individuals.</i>
H 6	<i>Evaluation apprehension in individuals is negatively related to knowledge sharing behavior.</i>
H 7	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of low (high) evaluation apprehension in individuals.</i>
H 8	<i>Perceptions of loss of power and knowledge sharing behavior are negatively related.</i>
H 9	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of low (high) perceptions of loss of power.</i>
H 10	<i>High perceptions of justice will increase knowledge sharing behavior in individuals.</i>
H 11	<i>The relationship between specialization and knowledge sharing behavior will be weakened (strengthened) under the influence of low (high) perceptions of justice in individuals.</i>
H 12	<i>Work group cohesiveness and knowledge sharing behavior are positively related.</i>
H 13	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of high (low) work group cohesiveness.</i>

Research Method

In this chapter, we first discuss the appropriateness of using a survey methodology for the study. The second section describes the sample, data collection and data screening procedures. The third section describes the measures and measurement items used in the study. The fourth section describes the analysis conducted to assess the measurement model. The fifth and sixth sections describe the hypothesis testing and the results obtained.

Survey Research

Three methods for collecting and analyzing data in social science research are case studies, survey research and experiments. The techniques used for collecting data such as questionnaire, structured interviews, observation or content analysis can be adopted for any of the three methods.

Survey research is an appropriate method for studying phenomena in their natural setting where the researcher has *“very clearly defined independent and dependent variables and a specific model of the expected relationships which are tested against the observations of the phenomenon”* (Pinsonneault and Kraemer, 1993, pg. 78). Survey research is suitable for answering research questions of the types: *‘what’*, *‘how much’*, *‘how many’* and *‘to what extent’*, to statistically describe and explain the variability of concepts or characteristics being examined in a population (Babbie, 1998).

The strengths of quantitative surveys include accuracy, generalizability, and convenience (Babbie, 1998; Creswell, 2009; De Vaus, 2002); test of models (Weisberg et al., 1996) and development of theories (Raykov and Widaman, 1995), while the major

weakness in quantitative surveys is that they cannot provide deep contextual information due to their inflexibility in soliciting free or open ended answers from the respondents (Babbie, 1998).

Questionnaire surveys enable data collection in a standardized format; reducing the time required for analysis, due to the availability of software applications. Questionnaire surveys are also suitable for objective analysis, an important feature of the positivistic stream of research (Burrell and Morgan, 1979) and provide a statistical basis for making inferences and sound conclusions. Researchers collecting data need to ensure that the samples of the population from which data are collected are random samples, i.e., each case/respondent had an equal probability of being selected. Using random samples helps generalize the results to the universe (or population) by describing the population from which the cases/respondents were selected, thereby achieving higher external validity (Simon, 1969).

Pretest and Pilot testing

Participation in the study was on a voluntary basis for all phases of the research: the pretest, pilot test and subsequent data collection. The survey instrument was pre-tested by soliciting responses from IS/IT professionals to validate the survey questionnaire prior to being administered using two methods (Straub, 1989): a) by presenting it to 5 academics to elicit their feedback on the content validity of the constructs measured in the model, wording of the measurement items and overall instrument quality, and by b) presenting it to 5 IS/IT professionals to elicit their opinions and feedback on the clarity of measures and the overall quality of the questionnaire. Subsequent to incorporating feedback from the

respondents⁴, a pilot test was conducted using the refined instrument to assess the clarity, relevance and specificity of the items and using a checklist of criteria (e.g. Church and Waclawski, 2001, pg. 85-86) to successively improvise the survey questionnaire further before administration (Chan et al., 1997).

Sample Size Estimation

Prior literature has suggested the “a-priori” calculation of sample sizes in planning research projects rather than using rules of thumb (Baroudi and Orlikowski, 1989; Diamantopoulos, 2011), to better interpret results by accounting for parameters such as effect size and power rather than interpreting results relying on significance levels (Sawyer and Ball, 1981).) The research model consists of nine predictor variables. To ensure an adequate sample size on the higher end, we assumed that all nine predictor variables may directly affect the dependent variable. In order to estimate the sample size required for the study, we conducted an a priori power analysis using statistical software G*Power 3 (<http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/>) utilized in prior IS research (Hsu and Sabherwal, 2012).

We conducted a statistical test for linear multiple regression, fixed model and R^2 increase under the family of F tests. Cohen (1988, 1992) suggests the use of medium effect sizes for social science research. We assumed an effect size of 0.15 (medium effect) and a power of 0.80 for the study resulting in a minimum sample size of 114 for assessing the model structure. We compared the results using an alternative approach using the number

⁴ These responses were not included for further analysis or during hypotheses testing.

of latent and observed variables using web software maintained by an IS academician⁵ which suggested a minimum sample size of 123 for assessing the model structure. Thus a sample size of around 125 responses appears to be sufficient.

Data Collection Procedures

The target respondents for the survey are IS/IT professionals and the level of analysis is at the individual level. Subsequent to obtaining Human Subjects Institutional Review Board (IRB) approval at UMSL for the questionnaire survey and the data collection procedures, an online version of the survey instrument (Appendix - A) was developed using Qualtrics[®], a data collection software application portal. The web-based questionnaire survey was used for collecting data among IS/IT professionals. Several approaches were used to collect data in order to meet the estimated sample size. The proposed research was presented to the Information Systems Advisory Board (ISAB) members at the University of Missouri – St. Louis (UMSL) to solicit their support for data collection from the organizations they represent. The survey link was emailed to all the members of the ISAB with a letter of introduction explaining the purpose of the research requesting them to forward it to IS/IT professionals in their respective organizations. The survey link was also circulated through IT professionals within the UMSL alumni network on social media sites such as *LinkedIn* with the support of a senior IS Professor at UMSL, and among Qualtrics' panel members with a request for participation in research and forwarding the survey link

⁵ A priori sample size calculator for Structural Equation Models maintained by Dr. Daniel Soper
<http://www.danielsoper.com/statcalc3/calc.aspx?id=89>

to other known IS/IT professionals. In addition, the survey link was electronically circulated among several individuals and organizations the researcher came across.

Data Screening Procedures

A total of 1468 members clicked on the survey link and only 379 members proceeded further with the survey, resulting in a response rate of 25.8%. We used two screening questions: a) “Are you an IT professional?” and b) “Were you born in the USA?” to restrict our sample to American IT professionals. This may be the possible reason for a large attrition at this stage. Of the 379 respondents who advanced to the subsequent questions, 133 respondents quit the survey at various stages resulting in a completion rate of 16.8%. The low completion rate could have been due to several reasons, including work or time pressures on the job, the survey length or, certain questions being not applicable for some respondents.

Among the 246 surveys completed, 35 (14.2%) responses contained missing values for one or more questionnaire items. We eliminated cases with missing responses resulting in a total of 211 completed responses with no missing values. In order to further prepare the data for analyses, we calculated the case wise standard deviation (SD) for each respondent. Any case which had a less than 0.5 SD (among responses within a case) is likely to have “breezed” through the survey, offering the same response on the scales provided for the questions, possibly without carefully reading them. We found 6 such cases and eliminated them from further analysis. The resulting data yielded 205 complete responses suitable for analysis. The characteristics of the sample are given in the ***Tables 6 to 8*** below.

Demographic Characteristics of Respondents

Table 3: Age			
	No. of Respondents	% Respondents	Cumulative Percent
20-25 years	8	3.9	3.9
26-30 years	25	12.2	16.1
31-35 years	31	15.1	31.2
36-40 years	50	24.4	55.6
41-45 years	19	9.3	64.9
46-50 years	26	12.7	77.6
51-55 years	20	9.8	87.3
55 + years	26	12.7	100
Total	205	100	

Table 4: Gender			
	No. of Respondents	% Respondents	Cumulative Percent
Female	57	27.8	27.8
Male	148	72.2	72.2
Total	205	100	100

Table 5: Education			
	No. of Respondents	% Respondents	Cumulative Percent
High School	9	4.4	4.4
Diploma	12	5.9	10.2
Bachelors	112	54.6	64.9
Masters	65	31.7	96.6
Doctoral	2	1	97.6
Others	5	2.4	100
Total	205	100	

Table 6: Reported Job Titles		
	No. of Respondents	% Respondents
Developer/Programmer/Analyst/Engineer	47	22.93%
Nil / Other designations (e.g. IT, Tech., Coordinator etc.)	40	19.51%
Managers/Supervisors	36	17.56%
Director (various)	25	12.20%
CIO/CEO/CTO	22	10.73%
Owner/Entrepreneur	10	4.88%
Network Administrators	10	4.88%
Architects (Data, Database etc.)	8	3.90%
System Administrators and Network Administrators	7	3.41%
Total	205	100

Table 7: Organization Size		
	No. of Respondents	% Respondents
0-100	23	11.22
100-500	39	19.02
500-1000	21	10.24
1000-5000	66	32.20
5000+	56	27.32
Others	0	0.00
Total	205	100

Table 8: IT Experience ($n=205$)	
	No. of Respondents
Minimum	1
Maximum	42
Mean	13.39
Standard Deviation	9.541

The demographic data shows that the data collected came from IT professionals of differing age groups, varying educational levels, job titles and IT experience. Thus, the sample obtained appears to adequately represent the IT professional population in the US.

Testing for Non-response Bias

In order to test for non-response bias among respondents, two approaches exist in the literature. Armstrong and Overton (1997) suggest dividing the sample into two equal sections, based on the times of responses received, into “early” and “late” and comparing the two parts for differences (at $p > 0.10$) whereas, King and Sabherwal (1992) suggest dividing the sample into three equal parts and comparing the first and last one third parts; in order to clearly distinguish between early and late respondents (at $p > 0.50$). We adopted the approach suggested by King and Sabherwal (1992) and conducted ANOVA tests for Age, Education level and Tenure in years (in current organization) variables and found no significant differences between early and late respondents. The results from ANOVA tests were as follows: Age $F(2, 202) = 2.150$, $p > 0.05$; Education Level $F(2, 202) = 0.713$, $p > 0.05$ and Tenure $F(2, 202) = 2.867$, $p > 0.05$. We also utilized the option to examine Tukey’s test statistic in SPSS. The multiple comparisons results, for each variable tested,

found no significant differences among the three groups for Tukey's HSD test therefore eliminating the possibility of any significant differences arising from early and late respondents in our sample.

In order to minimize Common Method Bias (CMB), we followed the steps suggested by Podsakoff et al. (2003). To test whether common method bias exists in our data, we conducted Harman's one-factor test (Podsakoff and Organ 1986) by performing an exploratory factor analysis on all variables to check for the presence of any single factor. Podsakoff and Organ (1986) suggest an upper threshold value of 40% of the total variance to be accounted for by an un-rotated common factor. The variance accounted for by the un-rotated first factor was 36.154% of the total variance indicating that there was no major common method bias threat in our data.

We also checked for common method bias using a Common Latent Factor in AMOS. The results show no differences in estimates (Delta values) larger than 0.2 indicating that common method bias was not a threat. The path diagram is shown in *Figure - 4* and the results in *Table - 9*.

Standardized Regression Weights: (With CLF)				Standardized Regression Weights: (Without CLF)				
Items	Path Direction	Construct	Estimate	Items	Path Direction	Construct	Estimate	Deltas
DJ4	<---	DistrJus	0.877	DJ4	<---	DistrJus	0.889	0.012
DJ3	<---	DistrJus	0.86	DJ3	<---	DistrJus	0.872	0.012
DJ2	<---	DistrJus	0.857	DJ2	<---	DistrJus	0.87	0.013
DJ1	<---	DistrJus	0.792	DJ1	<---	DistrJus	0.805	0.013
INFJ5	<---	InfJustice	0.832	INFJ5	<---	InfJustice	0.845	0.013
INFJ4	<---	InfJustice	0.739	INFJ4	<---	InfJustice	0.757	0.018
INFJ3	<---	InfJustice	0.765	INFJ3	<---	InfJustice	0.779	0.014

INFJ2	<---	InfJustice	0.719	INFJ2	<---	InfJustice	0.735	0.016
PJ7	<---	ProcJustice	0.705	PJ7	<---	ProcJustice	0.721	0.016
PJ6	<---	ProcJustice	0.637	PJ6	<---	ProcJustice	0.653	0.016
PJ4	<---	ProcJustice	0.718	PJ4	<---	ProcJustice	0.731	0.013
PJ3	<---	ProcJustice	0.752	PJ3	<---	ProcJustice	0.768	0.016
KSB4	<---	KSBehav	0.812	KSB4	<---	KSBehav	0.826	0.014
KSB3	<---	KSBehav	0.83	KSB3	<---	KSBehav	0.84	0.01
KSB2	<---	KSBehav	0.796	KSB2	<---	KSBehav	0.81	0.014
KSB1	<---	KSBehav	0.801	KSB1	<---	KSBehav	0.815	0.014
LOSPOW4	<---	LossPow	0.908	LOSPOW4	<---	LossPow	0.91	0.002
LOSPOW3	<---	LossPow	0.952	LOSPOW3	<---	LossPow	0.955	0.003
LOSPOW2	<---	LossPow	0.938	LOSPOW2	<---	LossPow	0.94	0.002
LOSPOW1	<---	LossPow	0.879	LOSPOW1	<---	LossPow	0.882	0.003
FNE6r	<---	Eval	0.884	FNE6r	<---	Eval	0.89	0.006
FNE5r	<---	Eval	0.839	FNE5r	<---	Eval	0.836	-0.003
FNE3r	<---	Eval	0.906	FNE3r	<---	Eval	0.911	0.005
FNE2r	<---	Eval	0.867	FNE2r	<---	Eval	0.872	0.005
INTJ4	<---	Intjustice	0.688	INTJ4	<---	Intjustice	0.703	0.015
INTJ3	<---	Intjustice	0.875	INTJ3	<---	Intjustice	0.891	0.016
INTJ1	<---	Intjustice	0.817	INTJ1	<---	Intjustice	0.835	0.018
NORM6	<---	PSNorms	0.718	NORM6	<---	PSNorms	0.725	0.007
NORM4	<---	PSNorms	0.867	NORM4	<---	PSNorms	0.872	0.005
NORM1	<---	PSNorms	0.813	NORM1	<---	PSNorms	0.821	0.008
ALT4	<---	Altrui	0.9	ALT4	<---	Altrui	0.906	0.006
ALT3	<---	Altrui	0.861	ALT3	<---	Altrui	0.868	0.007
ALT1	<---	Altrui	0.843	ALT1	<---	Altrui	0.854	0.011
SPEC4	<---	Specailization	0.798	SPEC4	<---	Specailization	0.81	0.012
SPEC3	<---	Specailization	0.717	SPEC3	<---	Specailization	0.722	0.005
SPEC2	<---	Specailization	0.803	SPEC2	<---	Specailization	0.815	0.012
DJ2	<---	CLF	0.152					
DJ1	<---	CLF	0.137					
DJ3	<---	CLF	0.142					
DJ4	<---	CLF	0.145					
INFJ2	<---	CLF	0.137					
INFJ3	<---	CLF	0.148					
INFJ4	<---	CLF	0.144					
INFJ5	<---	CLF	0.139					
PJ3	<---	CLF	0.147					
PJ4	<---	CLF	0.133					
PJ6	<---	CLF	0.136					
PJ7	<---	CLF	0.154					

KSB1	<---	CLF	0.139					
KSB2	<---	CLF	0.142					
KSB3	<---	CLF	0.136					
KSB4	<---	CLF	0.142					
LOSPOW1	<---	CLF	0.067					
LOSPOW2	<---	CLF	0.065					
LOSPOW3	<---	CLF	0.069					
LOSPOW4	<---	CLF	0.069					
FNE2r	<---	CLF	0.098					
FNE3r	<---	CLF	0.103					
FNE6r	<---	CLF	0.098					
INTJ1	<---	CLF	0.164					
INTJ3	<---	CLF	0.157					
INTJ4	<---	CLF	0.135					
NORM1	<---	CLF	0.103					
NORM4	<---	CLF	0.103					
NORM6	<---	CLF	0.091					
ALT1	<---	CLF	0.123					
ALT3	<---	CLF	0.115					
ALT4	<---	CLF	0.115					
SPEC2	<---	CLF	0.127					
SPEC3	<---	CLF	0.115					
SPEC4	<---	CLF	0.138					

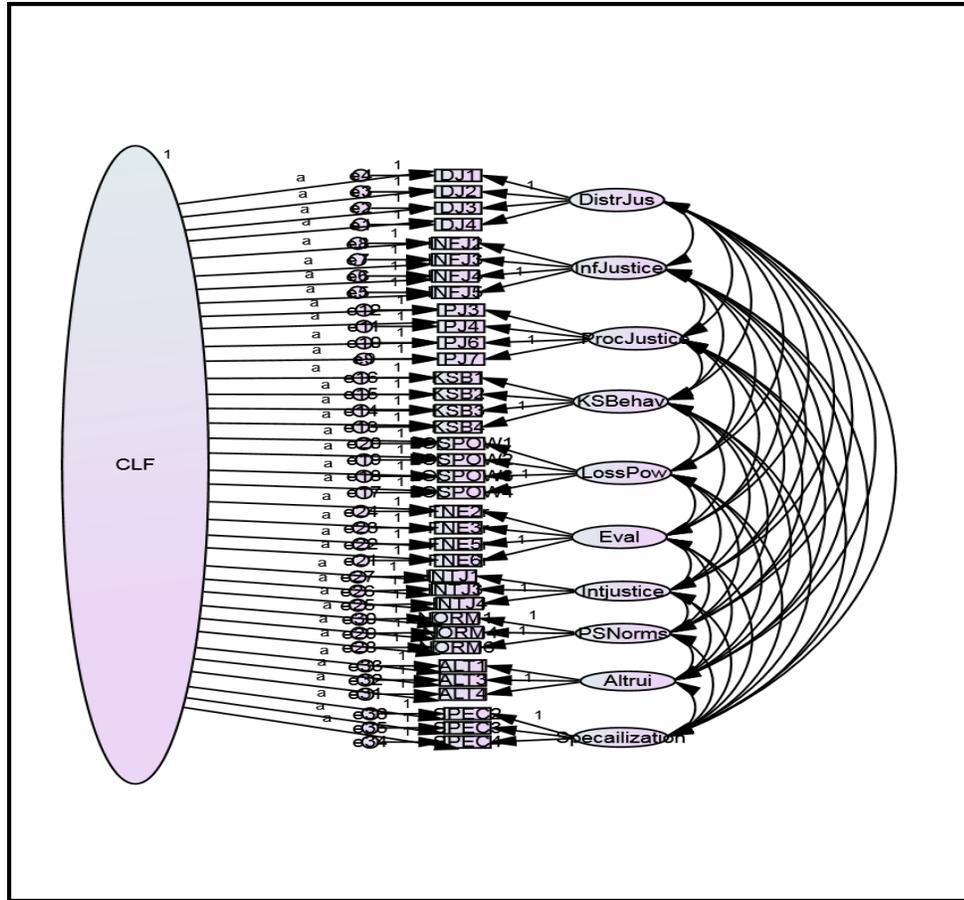


Figure 4: Common Latent Factor Test Path Diagram in AMOS

We then checked whether any construct pairs exhibited multicollinearity using SPSS. Multicollinearity can be a serious problem when conducting moderation tests during regression analysis due to high inter-correlations among independent variables (Aiken and West, 1991). We tested for multicollinearity through successive iterations where we regressed all the independent variables (except one independent variable, which was used as a dependent variable) and checked for the Variance Inflation Factor (VIF) scores. In general VIF values above 5 are considered to be problematic (Bernstein, 2001).

During our tests for multicollinearity, we found that Work Group Cohesiveness exhibited VIF values exceeding 6 with two other constructs Pro Social Norms and Altruism. We therefore decided to drop the construct Work Group Cohesiveness from further analysis due to multicollinearity in our data. We believe that individuals who are altruistic and/or embrace the Pro Social Norms within their work groups are likely to exhibit higher work group cohesiveness as well. This may have contributed to the multicollinearity in our data. The VIFs for the remaining constructs were below the threshold values. The VIF values ranged from 1.601 to 2.894 for the constructs Justice and Altruism respectively with Pro-Social Norms as a dependent variable. Therefore, multicollinearity was not a threat in our study.

Next, we tested for normality and identified seven items which exhibited kurtosis values between 2 and 3. The items exhibiting Kurtosis were (PJ1, COH2, NORM2, SPEC1, SPEC2, ALT1, ALT2, ALT3 and ALT4). We did not drop these items from analysis at the EFA stage but, decided to conduct a Confirmatory Factor Analysis (CFA) and examine the Modification Indices and measurement model fit before making a decision on dropping measurement items.

Measures

Measures for the study were adapted from prior literature. Construct definitions are provided in **Table - 1**. Objective data such as organization size were obtained from respondents participating in the research. Pre validated measures sourced from prior literature are used to measure the constructs specified in the model. *Knowledge sharing behavior*, the dependent variable, was measured using measures from Ma and Agarwal

(2007) consisting of four items. Nine independent variables are hypothesized to affect the dependent variable. Measures for *Procedural justice*, *distributive justice*, *interpersonal justice* and *informational justice* were directly adopted from Colquitt (2001). *Work group cohesiveness* was measured using eight items, directly adopted from Riordan and Weatherly (1999). Measures for *evaluation apprehension* were adopted from Leary (1983). For parsimony we selected six items with high iter-item correlations from the original 12 item Fear of Negative Evaluation Scale.

For the *presence of specialization* construct, a six item measure was developed from prior sources in IS literature to reflect the concept being measured. Two items were adapted from Kankanhalli et al (2005), one from Lewis (2003) and three items from Faraj and Sproull, (2001). Six items for measuring *pro-sharing norms* were adapted from Kankanhalli et al (2005) while *altruism* was measured using a four item measure adapted from Kankanhalli et al (2005) by dropping the reference to Electronic Knowledge Repositories (EKRs). The survey instrument consists of 58 measurement items and 14 questions related to background and demographic information. All items are measured using Likert-type responses. The list of measurement items are provided in **Table – 10** below and the survey instrument is provided in *Appendix A*.

Table – 10: Constructs and Measurement Items

Construct	Measurement items	Source
<p>Knowledge Sharing Behavior</p> <p><i>(Dependent variable)</i></p>	<p><i>The following set of statements are related to your knowledge sharing in your main work group. Please select the most suitable response to each of the statements below.</i></p> <ol style="list-style-type: none"> 1. I often contribute my knowledge to others in my work group. 2. I regularly contribute my knowledge to others in my work group. 3. I often help others in my work group who need information. 4. I contribute my knowledge to others in my work group to help in the development of new insights. 	<p>Adapted from Ma and Agarwal (2007), <i>Information Systems Research</i> (pg.63)</p>
<p>Altruism</p>	<p><i>The following statements are related to your activities in your main work group. Please select the most suitable response to each of the statements below.</i></p> <ol style="list-style-type: none"> 1. I enjoy sharing my knowledge with others in my organization. 2. I enjoy helping others by sharing my knowledge in my organization. 3. It feels good to help others by sharing my knowledge in my organization. 4. Sharing my knowledge with others in my organization gives me pleasure. 	<p>Adapted from Kankanhalli et al (2005), <i>MIS Quarterly</i> by dropping reference to EKR's (pg.142)</p>
<p>Pro Sharing Norms</p>	<p><i>The next set of statements are related to your work environment. Please select the most suitable response to each of the following statements below.</i></p> <ol style="list-style-type: none"> 1. There is a norm of cooperation in my organization. 	<p>Adopted from Kankanhalli et al (2005), <i>MIS Quarterly</i> (pg.143)</p>

Construct	Measurement items	Source
	<ol style="list-style-type: none"> 2. There is a norm of collaboration in my organization. 3. There is a norm of team work in my organization. 4. There is a willingness to value and respond to diversity in my organization. 5. There is a norm of openness to conflicting views in my organization. 6. There is a norm of tolerance to mistakes in my organization. 	
<p>Presence of Specialized Knowledge</p>	<p><i>This section relates to your knowledge and skills with respect to Information Systems (IS) activities in your organization. Please select the most suitable response to each of the statements below.</i></p> <ol style="list-style-type: none"> 1. I have confidence in my ability to provide valuable knowledge to others in my organization. 2. I have confidence that I possess expertise needed to provide valuable knowledge to others in my organization. 3. I have knowledge about various aspects of my work that other members in my organization do not have. 4. I have confidence that I possess the required design expertise for executing tasks in my organization 5. I have confidence that I possess the required technical expertise for executing tasks in my organization 	<p>Items 1 and 2 adapted from Kankanhalli et al (2005), <i>MIS Quarterly</i> (pg.142)</p> <p>Item 3 adapted from Lewis (2003), <i>Journal of Applied Psychology</i> (pg.604)</p> <p>Items 4,5 and 6 based on Faraj and Sproull, (2001), <i>Management Science</i> (pg.1559)</p>

Construct	Measurement items	Source
	6. I have confidence that I possess the required functional expertise for executing tasks in my organization.	
Evaluation Apprehension	<p><i>The next set of statements are related to your feelings about your main work group. Please select the most suitable response to each of the statements below.</i></p> <ol style="list-style-type: none"> 1. I am afraid that others in my organization will not approve of what I say or contribute. 2. I am afraid that other people in my organization will find fault with my actions. 3. When I'm talking to someone in my organization, I worry about what they may be thinking about me. 4. I am usually worried about what kind of impression I make with others in my organization. 5. Sometimes I think I am too concerned about what other people in my organization think of me. 6. I often worry that I will say or do the wrong things at work. 	<p>For parsimony we selected 6 items with high inter-item correlations from the original 12 item</p> <p>Fear of Negative Evaluation Scale</p> <p>Leary (1983) <i>Personality and Social Psychology Bulletin</i> (pg.373)</p>
Work Group Cohesiveness	<p><i>The next set of statements are related to your main work group. Please select the most suitable response to each of the statements below.</i></p> <ol style="list-style-type: none"> 1. In my work group, there is a lot of team spirit among the members. 	<p>Adopted from Riordan and Weatherly (1999) <i>Educational and Psychological</i></p>

Construct	Measurement items	Source
	<ol style="list-style-type: none"> 2. In my work group, group members know that they can depend on each other. 3. In my work group, group members stand up for one another. 4. In my work group, individuals pitch in to help one another. 5. In my work group, group members take interest in one another. 6. In my work group, group members regard each other as friends. 7. In my work group, group members are very cooperative with one another. 8. In my work group, group members work as a team. 	<p><i>Measurement</i> (pg.316)</p>
<p>Prodedural Justice</p>	<p><i>Please refer to the procedures used to make decisions about pay, rewards, evaluations, promotions, assignments, etc. in your main work group by selecting the most suitable response to each of the following statements.</i></p> <ol style="list-style-type: none"> 1. Are you able to express your views during those procedures? 2. Can you influence the decisions arrived at by those procedures? 3. Are those procedures applied consistently? 4. Are those procedures free of bias? 5. Are those procedures based on accurate information? 6. Are you able to appeal the decisions arrived at by those procedures? 	<p>Adopted from Colquitt (2001) <i>Journal of Applied Psychology</i> (pg.1192)</p>

Construct	Measurement items	Source
<p data-bbox="243 602 411 675">Distributive Justice</p>	<p data-bbox="522 375 1304 407">7. Do those procedures uphold ethical and moral standards?</p> <p data-bbox="474 444 1556 561"><i>Please refer to the procedures used to make decisions about pay, rewards, evaluations, promotions, assignments, etc. in your main work group by selecting the most suitable response to each of the following statements.</i></p> <ol data-bbox="522 597 1440 834" style="list-style-type: none"> 1. Do those outcomes reflect the effort you have put into your work? 2. Are those outcomes appropriate for the work you have completed? 3. Do those outcomes reflect what you have contributed to your work? 4. Are those outcomes justified, given your performance? 	<p data-bbox="1625 540 1877 740">Adopted from Colquitt (2001) <i>Journal of Applied Psychology</i> (pg.1192)</p>
<p data-bbox="233 1073 422 1146">Interpersonal Justice</p>	<p data-bbox="474 873 1556 990"><i>Please refer to the procedures used to make decisions about pay, rewards, evaluations, promotions, assignments, etc. in your main work group by selecting the most suitable response to each of the following statements.</i></p> <ol data-bbox="522 1026 1446 1263" style="list-style-type: none"> 1. Has your supervisor treated you in a polite manner? 2. Has your supervisor treated you with dignity? 3. Has your supervisor treated you with respect? 4. Has your supervisor refrained from improper remarks or comments? 	<p data-bbox="1625 1011 1877 1211">Adopted from Colquitt (2001) <i>Journal of Applied Psychology</i> (pg.1192)</p>

Construct	Measurement items	Source
<p>Informational Justice</p>	<p><i>Please refer to the procedures used to make decisions about pay, rewards, evaluations, promotions, assignments, etc. in your main work group by selecting the most suitable response to each of the following statements.</i></p> <ol style="list-style-type: none"> 1. Has your supervisor been candid when communicating with you? 2. Has your supervisor explained decision-making procedures thoroughly? 3. Were your supervisor’s explanations regarding procedures reasonable? 4. Has your supervisor communicated details in a timely manner? 5. Has your supervisor tailored communications to meet individuals’ needs? 	<p>Adopted from Colquitt (2001) <i>Journal of Applied Psychology</i> (pg.1192)</p>
<p>Loss of Power</p>	<p><i>The following statements are related to your perceptions of the consequences of sharing knowledge in your main work group. Please select the most suitable response to each of the statements below.</i></p> <ol style="list-style-type: none"> 1. Sharing my knowledge makes me lose my unique value in the organization. 2. Sharing my knowledge makes me lose my power base in the organization. 3. Sharing my knowledge makes me lose my knowledge that makes me stand out with respect to others. 4. Sharing my knowledge makes me lose my knowledge that no one else has. 	<p>Adopted from Kankanhalli et al (2005), <i>MIS Quarterly</i> (pg.141)</p>

Analysis

Measurement Model

We first conducted an Exploratory Factor Analysis (EFA) and then a Confirmatory Factor Analysis (CFA) following the procedures adopted in prior literature (Barua et al, 2004). We included all measurement items in SPSS Statistics 22 and performed an EFA using Principal Component Analysis with Promax rotation. Though our study is empirical and the measurement items, and expected factors are known *a-priori*, we first extracted factors based on the Eigen values greater than 1 to test the general factor structure before proceeding further and setting the number of factors to be extracted to be equal to ten. The factor rotation converged in 8 iterations and cumulative variance extracted was 77.292%. The resulting Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA) was 0.914 and Bartlett's test of Sphericity Chi-Squared value was 9229.213 (df: 11128; Sig. 0.000). Factor loadings greater than 0.50 as suggested by Hair et al. (2006) were obtained on separate factors and ranged from 0.421 (item: KSB3) to 0.980 (item: SPEC3). The interpersonal and informational justice items cross loaded on one factor instead of two separate factors and procedural justice items loaded on two factors but all item values were above the 0.4 threshold. We reduced the factors extracted to nine and found that all procedural justice items loaded on one factor with interpersonal and informational justice items continuing to exhibit a single factor structure. Since we know *a-priori* that interpersonal justice and informational justice are theoretically distinct, rather than accept the statistical result in the EFA and treat them as one factor, we proceeded with analysis

treating them as separate factors and decided to perform a CFA to assess construct validities. The factor loadings are shown in *TABLE - 11*.

Table 11: Factor Analysis Results										
Pattern Matrix ^a										
	Component									
	1	2	3	4	5	6	7	8	9	10
INFJ1	.673									
INFJ2	.662									
INFJ3	.756									
INFJ4	.868									
INFJ5	.749									
FNE1r		.834								
FNE2r		.857								
FNE3r		.857								
FNE4r		.947								
FNE5r		.900								
FNE6r		.868								
DJ1			.755							
DJ2			.919							
DJ3			.982							
DJ4			.898							
NORM1				.876						
NORM2				.874						
NORM3				.919						
NORM4				.859						
NORM5				.758						
SPEC1					.603					
SPEC2					.835					
SPEC3					.980					
SPEC4					.760					
ALT1						.841				
ALT2						.679	.363			
ALT3						.849				
ALT4						.950				
LOSPOW1							.910			
LOSPOW2							.784			
LOSPOW3							.839			
LOSPOW4							.891			

KSB1						.303		.633		
KSB2								.687		
KSB3						.337		.421		
KSB4						.302		.559		
NORM6				.729						
INTJ1	.794									
INTJ2	.739									
INTJ3	.874									
INTJ4	.894									
PJ3			.317							
PJ4			.355							.529
PJ1								.865		
PJ2			.390					.672		
PJ5			.486							.615
PJ6								-.425	.462	
PJ7										.554

Extraction Method: Principal Component Analysis.
 Rotation Method: Promax with Kaiser Normalization.
 a. Rotation converged in 8 iterations.

We then used AMOS Graphics to conduct a Confirmatory Factor Analysis (CFA). We first standardized all item scores and then, constructed a CFA model based on prior theory. We covaried the constructs and calculated the model estimates. We then examined the path diagram and the Modification Indices (M.I.) values in the AMOS output for large MI values. Wherever theoretically possible (i.e., only error terms measuring the same construct were covaried), we created covariances between the error terms to reduce the MI values between the error term pairs suggested by AMOS.

Ideally, a MI value below 15 is desirable and model fit statistics for CMIN/df, (ranging between 1 and 3), CFI (>0.950), RMSEA (<0.060) and PCLOSE (>0.050) must be in their acceptable ranges.

Subsequent to exhausting possible options for covarying error terms with high MI values, we successively began dropping items, starting from the highest MI values first and

re-calculating estimates at each step for the change undertaken (e.g. we first dropped item PJ1. This item had a MI of 21.334; also an item having a kurtosis value of 2.482, identified in our earlier test for normality).

Altogether, eleven items were dropped from our list of original survey items during our successive iterations. During our analysis, we observed some items dropped, such as PJ1, ALT2, and NORM2, were also identified to have high kurtosis values during our tests for normality of data. We also observed that few items dropped had earlier cross loaded on factors (other than their expected factors) during factor analysis (e.g. PJ5 cross loaded on the distributive justice factor). Specifically, three procedural justice items (PJ1, PJ2 and PJ5), one interpersonal justice item (INTJ1), 2 evaluation apprehension items (FNEr1 and FNEr4), one item from altruism (ALT2), three from norms (NORMS2, NORM3 and NORM5) and one from presence of specialization (SPEC1) were dropped from further analysis. The resulting path diagrams is shown in *Figure - 5* below.

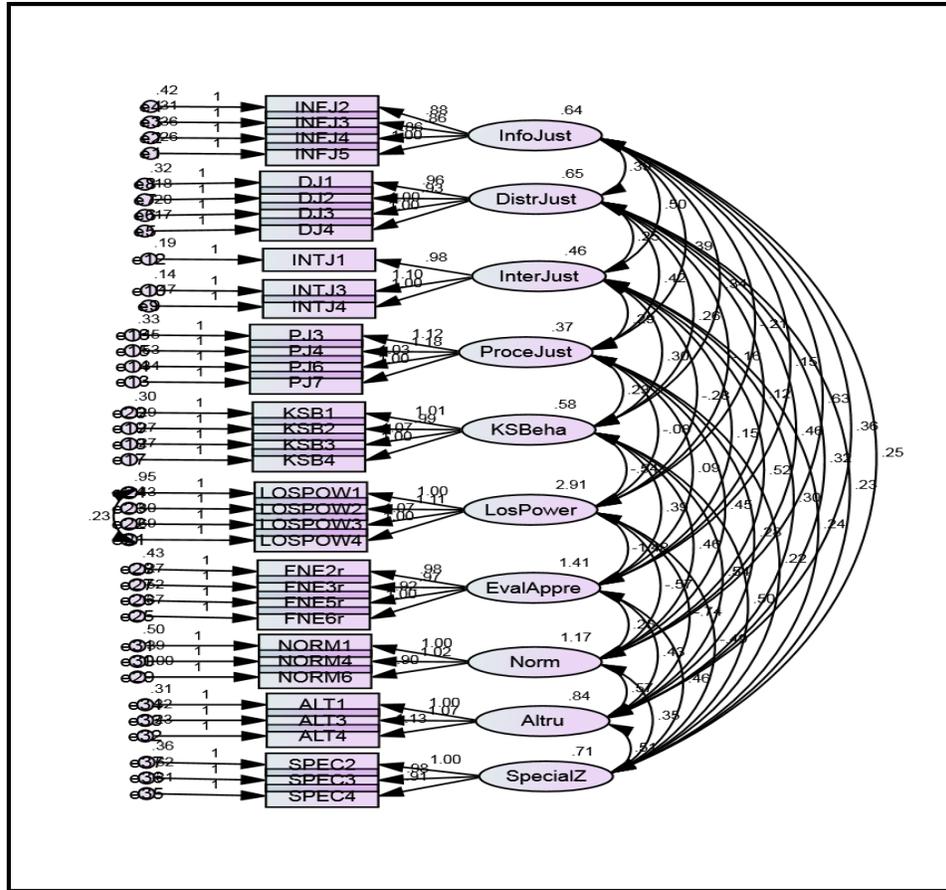


Figure – 5: Initial CFA Path Diagram

All our MI values were below 15 and satisfactory model fit statistics were obtained. The model fit statistics are as shown in **TABLE - 12** below. The AMOS output details are provided in *Appendix – D*.

Table - 12: CFA Results		
Fit Statistic	Final value	Recommended
CMIN/df	1.576	Low =1, High = 3
CFI	0.947	>0.950
AGFI	0.779	>0.70
RMSEA	0.053	<0.060
PCLOSE	0.219	>0.050

We then constructed a second order perceptions of justice CFA model and tested to see if the four factor structure for perceptions of justice converges, exhibiting a clear second order structure. All four factors loaded well on the second order factor. Subsequent to assessing the second order perceptions of justice factor, we constructed the measurement model to include the second order structure and analyzed the CFA. The model converged with acceptable fit statistics as shown in the *Figure - 6* and *Table - 13* below.

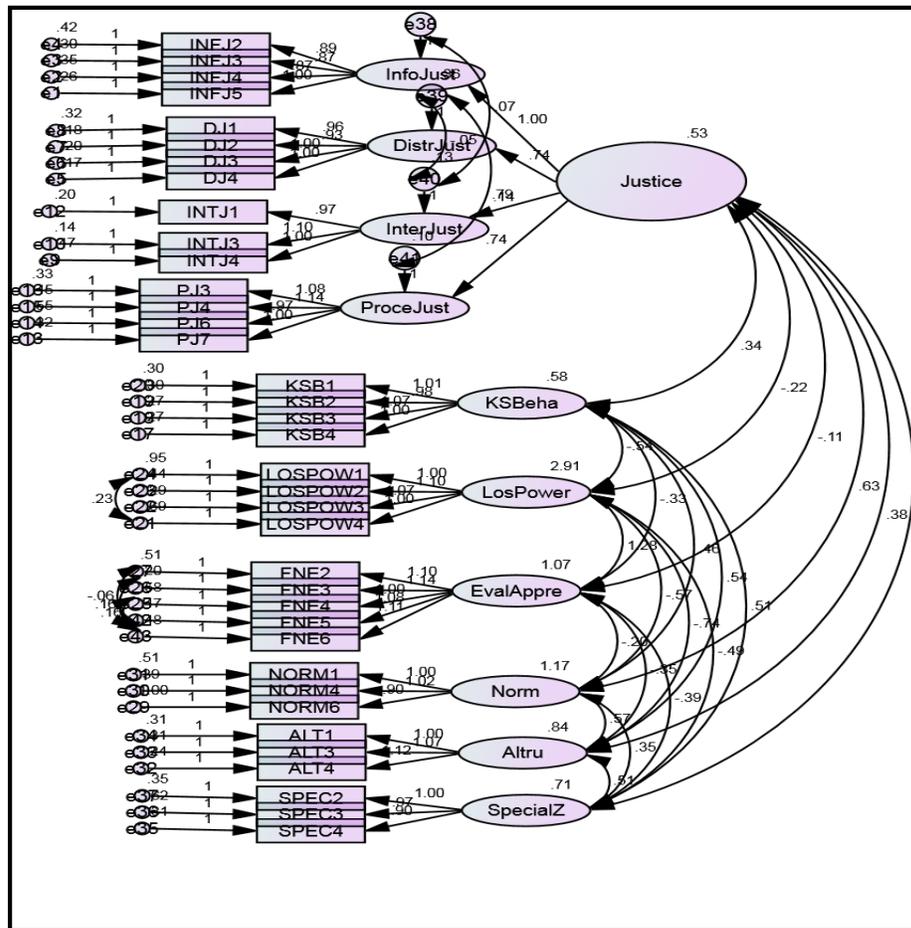


Figure – 6: CFA Path Diagram with Second Order Justice Factor

Table - 13: CFA Results with Second Order Justice Factor		
Fit Statistic	Final value	Recommended
CMIN/df	1.556	Low =1, High = 3
CFI	0.946	>0.950
AGFI	0.777	>0.70
RMSEA	0.052	<0.060
PCLOSE	0.283	>0.050

We assessed construct reliabilities for all constructs. The Cronbach's Alphas for the constructs were: Knowledge Sharing Behavior ($\alpha = .894$), Altruism ($\alpha = 0.906$), Loss of Power ($\alpha = 0.958$), Pro-Social Norms ($\alpha = 0.838$), Procedural Justice (0.806), Distributive Justice (0.917), Informational Justice (0.863), Interpersonal Justice (0.839), Presence of Specialization (0.823) and Evaluation Apprehension (0.938). Nunnally (1978) suggests a threshold value of 0.70 of Cronbach Alpha values for multi-item constructs. All Cronbach Alpha values obtained were above the threshold value indicating acceptable construct reliability.

We assessed convergent validity of the constructs by examining the Average Variance Extracted (AVE). AVE values above 0.5 are required for establishing convergent validity (Bagozzi, 1980; Fornell and Larcker, 1981). All our AVE values were above the 0.5 threshold, indicating good convergent validity. In order to assess discriminant validity, we compared the values on the diagonal of in *Table - 14* which are the square root values of the average variance extracted with the correlations with other constructs similar to procedures adopted in prior literature (e.g. Sabherwal, and Bercerra-Fernandez, 2003; Dinev and Hart, 2006). All values are above their inter-construct correlations except for

Specialization, at the the third decimal place. Since all other parameters were in acceptable range for this construct, we proceeded with our analysis. Since composite reliability provides a better estimate of internal consistency compared to Cronbach's alpha (Chin and Gopal, 1995), we examined the Composite Reliability (CR) scores.

All values were above the preferable value of 0.8 (Koufteros, 1999) and greater than the minimum threshold of 0.7 (Gefen et al, 2000). Taken together, the results obtained indicate no threat to construct validity in our study.

Table - 14: Assessing Construct Validity												
	CR	AVE	MSV	ASV	(a)	(b)	(c)	(d)	(e)	(f)	(g)	
Specialization (a)	0.827	0.614	0.623	0.289	0.784							
Knowledge Sharing Behavior (b)	0.893	0.677	0.623	0.379	0.789	0.823						
Loss of Power (c)	0.955	0.842	0.526	0.195	-0.343	-0.417	0.918					
Evaluation Apprehension (d)	0.934	0.738	0.526	0.183	-0.452	-0.418	0.725	0.859				
Pro Sharing Norms (e)	0.846	0.649	0.643	0.260	0.380	0.562	-0.306	-	0.177	0.805		
Altruism (f)	0.908	0.768	0.598	0.343	0.658	0.773	-0.476	-	0.373	0.578	0.876	
Perceptions of Justice (g)	0.895	0.683	0.643	0.271	0.461	0.625	-0.178	-	0.150	0.802	0.570	0.826

Hypotheses Testing

To test the hypothesized relationships in our model, we ran regression analyses in SPSS Statistics 22. We first calculated the means, standard deviations and Pearson Correlation coefficients for all variables and used standardized scores for creating the interaction terms for variables expected to have moderating relationships.

In all, we created and tested twelve different models. Our first model consisted of four control variables which was Model 1 (Baseline model). We systematically entered other independent variables successively, running regression analysis at each step.

We then tested for both direct and indirect effects by including the interaction terms in Models 2 through Model 12. The means, standard deviations, and Pearson correlations are shown in *Table - 15* below.

Table - 15: Means, Standard Deviations and Correlations												
Construct	Mean	S.D.	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
(a)	1.61	.7163	1									
(b)	1.32	.6917	.845*	1								
(c)	4.71	1.733	-	-	1							
(d)	2.32	1.139	.635*	.604*	-	1						
(e)	1.72	.7893	.850*	.717*	-	.433*	1					
(f)	1.57	.6330	.635*	.530*	-	.722*	.455*	1				
(g)	1.91	.7524	.453*	.449*	-.096	.549*	.366*	.541	1			
(h)	1.80	.6241	.560*	.525*	-.126	.685*	.441*	.722	.933	1		
(i)	1.86	.6879	.634*	.538*	-	.781*	.443*	.910	.627	.795	1	
(j)	3.316	1.123	-	-	.737*	-	-	-	-	-	-	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Constructs: Knowledge Sharing Behavior (a); Altruism (b); Loss of Power (c); Pro-Sharing Norms (d); Presence of Specialization (e); Interpersonal Justice (f); Distributive Justice (g); Procedural Justice (h); Informational Justice (i) and Evaluation Apprehension (j).

Model 1 consisted of the control variables: Tenure, Age, Education and Gender in the study. Only Tenure was significant ($\beta = -.228, p < .001$) whereas other control variables were not significant indicating that individuals who had been in the organization for a longer number of years were less likely to share their knowledge. This could perhaps be due to non-overlapping technical skills within the IT work context since senior managers and executives are less likely to be involved in day-to-day operational activities and therefore do not have much to share with their juniors.

We had six direct effects in our model. Hypothesis 1, Hypothesis 2, Hypothesis 4, Hypothesis 6, Hypothesis 8 and Hypothesis 10 and five indirect effects: Hypothesis 3, Hypothesis 5, Hypothesis 7, Hypothesis 9 and Hypothesis 11 in our research model. In Model 2, we entered the control variables and five independent variables to assess these effects. The results of the hypotheses tests are described below.

Hypothesis 1 stated: The presence of specialization is positively related to knowledge sharing behavior. In Model 2, the standardized beta value for the presence of specialization is significant ($\beta = .516, p < .001$) suggesting that individuals with a higher perceived level of presence of specialization within themselves were more likely to engage in higher levels of knowledge sharing behavior, confirming support for hypothesis 1.

We hypothesized a positive relationship between Pro sharing norms in organizations and individual knowledge sharing behavior in our second hypothesis. The standardized beta for Pro sharing norms in Model 2 is significant ($\beta = .204, p < .001$) suggesting that individuals who subscribe to the normative values within their work groups experience higher levels of Pro Sharing Norms and are more likely to share their knowledge; rather than those who experience lower levels of pro sharing norms. Therefore, hypothesis 2 is supported.

Hypothesis 4 suggests individual Altruism and knowledge sharing behavior are positively related. Our results in Model 2 confirm the hypothesized effect of Altruism on knowledge sharing behavior. The standardized beta is significant ($\beta = .333, p < .001$) suggesting that altruistic individuals are more likely to share their knowledge than others, indicating support for Hypothesis 4.

Hypothesis 6 stated: Evaluation apprehension in individuals is negatively related to knowledge sharing behavior. The standardized beta for Evaluation apprehension in Model 2 is not significant ($\beta = -.057, p > .10$). A negative relationship between Evaluation apprehension and knowledge sharing behavior is suggested in our result but, its effect is not significant indicating no support for hypothesis 6.

Hypothesis 8 states that perceptions of loss of power are negatively related to knowledge sharing behavior in individuals. The regression results in Model 2 confirm the negative relationship between perceptions of loss of power and knowledge sharing behavior. The standardized beta however, is not significant ($\beta = -.069$, $p > .05$), suggesting that there is no relationship between perceptions of loss of power and knowledge sharing behavior among individuals indicating no support for hypothesis 8.

Next, we created Model 3 including the second order Perceptions of Justice factor in the regression analysis. Hypothesis 10 suggests individuals experiencing higher levels of perceived justice among members of their work group are more likely to share their knowledge. The results in Model 3 confirm the hypothesized effect of Perceptions of Justice on knowledge sharing behavior. The standardized beta is significant ($\beta = .197$, $p < .001$), indicating support for Hypothesis 10.

In the next four models, Model 4 through Model 7, we removed the second order justice factor as an independent variable, retaining all other independent variables, and included each of the four first order justice factors, Distributive Justice, Procedural Justice, Interpersonal Justice and Informational Justice one step at a time in Model 4, 5, 6 and 7 respectively to understand how each of the factors influences knowledge sharing behavior. We found that Distributive Justice and Procedural Justice had no significant effect on knowledge sharing behavior. The standardized beta values were ($\beta = .015$, $p > .05$) and ($\beta = .043$, $p > .05$) respectively. On the other hand, Interpersonal Justice and Informational

Justice were found to have a significant positive relationship with knowledge sharing behavior with standardized beta values ($\beta = .146$, $p < .001$) and ($\beta = .157$, $p < .001$), respectively.

Similar to the steps outlined in the above paragraph, we included the interaction terms with Presence of Specialization and each of the four first order justice factors to assess both, their direct and indirect effects along with other interaction terms. We found that none of the interaction terms were significant. The standardized beta values were: Specialization_X_Distributive Justice ($\beta = .077$, $p > .05$), Specialization_X_Procedural Justice ($\beta = .042$, $p > .05$), Specialization_X_Interpersonal Justice ($\beta = -.028$, $p > .05$) and Specialization_X_Informational Justice ($\beta = .030$, $p > .05$) in Model 9, Model 10, Model 11 and Model 12 respectively.

Model 9 is our proposed research model. We removed all first order justice factors and their interaction terms and included the second order justice factor and its interaction term with presence of specialization. We found that the interaction between presence of specialization and the second order justice factor to be not significant ($\beta = .023$, $p > .05$). Five direct effects, three at $p < .001$ level for Altruism ($\beta = .292$, $p < .001$), Presence of Specialization ($\beta = .461$, $p < .001$) and Perceptions of Justice ($\beta = .189$, $p < .001$) and, two at $p < .05$ level for Pro Sharing Norms ($\beta = .114$, $p < .05$), Loss of Power ($\beta = -.089$, $p < .05$) were supported.

Table16: Summary of Hypotheses Testing Results		
	Hypothesized Relationship	Result
H 1:	<i>The presence of specialization is positively related to knowledge sharing behavior.</i>	Supported
H 2:	<i>Pro sharing norms in organizations and individual knowledge sharing behavior are positively related.</i>	Supported
H 3:	<i>Increasing (decreasing) levels of pro sharing norms in organizations strengthen (weaken) the relationship between specialization and knowledge sharing behavior.</i>	Supported
H 4:	<i>Individual Altruism and knowledge sharing behavior are positively related.</i>	Supported
H 5:	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of (low) high altruism in individuals.</i>	Supported
H 6:	<i>Evaluation apprehension in individuals is negatively related to knowledge sharing behavior.</i>	Not Supported
H 7:	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of low (high) evaluation apprehension in individuals.</i>	Not Supported
H 8:	<i>Perceptions of loss of power are negatively related to knowledge sharing behavior.</i>	Supported
H 9:	<i>The relationship between specialization and knowledge sharing behavior will be strengthened (weakened) under the influence of high (low) perceptions of loss of power.</i>	Supported
H 10:	<i>High perceptions of justice will increase knowledge sharing behavior in individuals.</i>	Supported
H 11:	<i>The relationship between specialization and knowledge sharing behavior will be weakened (strengthened) under the influence of low (high) perceptions of justice in individuals.</i>	Not Supported

Three moderating effects were found to be significant between Presence of Specialization and Pro Sharing Norms ($\beta = .121, p < .05$), Loss of Power ($\beta = -.069, p < .05$) and Altruism ($\beta = -.101, p < .05$). In all, eight of eleven hypotheses were supported.

Table 17: Hypotheses Testing Results

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Tenure	-.228*	-.055	-.043	-.058	-.060	-.043
Gender	-.047	-.026	-.020	-.027	-.027	-.022
Age	-.130	.029	.019	.030	.030	.023
Education	-.002	-.006	.003	-.004	-.002	.006
Altruism		.333***	.323***	.330***	.327***	.331***
Evaluation Apprehension		-.057	-.045	-.058	-.058	-.043
Pro Social Norms		.204***	.057	.198***	.180***	.111**
Presence of Specialization		.516***	.483***	.514***	.509***	.489***
Loss of Power		-.069**	-.073**	-.071**	-.074**	-.061
Perceptions of Justice			.197***			
Distributive Justice				.015		
Procedural Justice					.043	
Interpersonal Justice						.146***
Informational Justice						
Specialization X Norms						
Specialization X Evaluation Apprehension						
Specialization X Loss Power						
Specialization X Altruism						
Specialization X Justice						
Specialization X Distributive Justice						
Specialization X Procedural Justice						
Specialization X Interpersonal Justice						
Specialization X Informational Justice						
Intercept	1.135**	.214	.144	.216	.213	.133
R ²	.106	.867	.877	.867	.868	.876
Adjusted R ²	.089	.861***	.871	.860	.861	.870

Standardized regression coefficients are reported. n = 205.

*p < .05; **p < .01; ***p < .001

Table 17: Hypotheses Testing Results (Continued)

Independent variables	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Tenure	-.040	-.052	-.071*	-.071*	-.051	-.049
Gender	-.020	-.026	-.028	-.031	-.026	-.026
Age	.017	.024	.033	.035	.026	.022
Education	-.001	.011	.008	.009	.012	.007
Altruism	.327***	.292***	.295***	.294***	.296***	.298***
Evaluation Apprehension	-.049	-.041	-.050	-.051	-.045	-.047
Pro Social Norms	.091***	.114*	.241***	.225***	.180***	.140**
Presence of Specialization	.495	.461***	.494***	.483***	.477***	.474***
Loss of Power	-.075	-.089*	-.086*	-.091*	-.082*	-.092*
Perceptions of Justice		.189***				
Distributive Justice			.048			
Procedural Justice				.063		
Interpersonal Justice					.124***	
Informational Justice	.157***					.160***
Specialization X Norms		.121*	.117*	.128*	.156**	.119
Specialization X Evaluation Apprehension		-.004	.002	.000	-.011	-.009
Specialization X Loss Power		-.069*	-.073*	-.075*	-.066*	-.077*
Specialization X Altruism		-.101*	-.148**	-.128*	-.095	-.111*
Specialization X Justice		.023				
Specialization X Distributive Justice			.077			
Specialization X Procedural Justice				.042		
Specialization X Interpersonal Justice					-.028	
Specialization X Informational Justice						.030
Intercept	.157	.117	.172	.172	.118	.131
R ²	.876	.888	.881	.881	.885	.887
Adjusted R ²	.869	.879	.872	.871	.876	.878

Standardized regression coefficients are reported. n = 205

*p < .05; **p < .01; ***p < .001

We found evidence for three minor interactions in this study. The interaction plots are shown in the figures below.

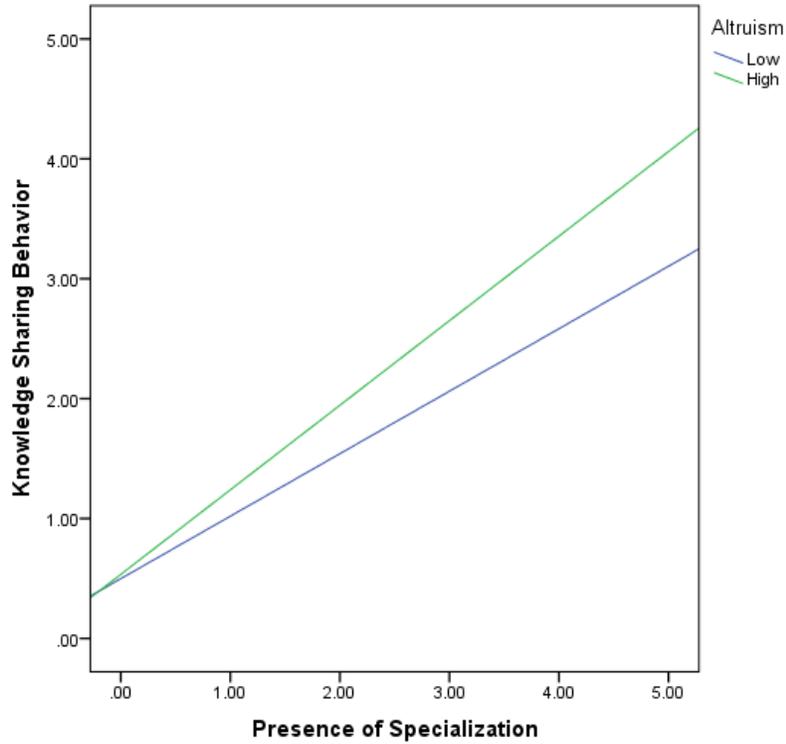


Figure – 7: Interaction Plot, Perceptions of Altruism Vs Presence of Specialization on Knowledge Sharing Behavior

As can be seen in **Figure - 7**, when levels of altruism are low, knowledge sharing behaviors are lowered and, vice versa when altruism levels are high; indicating the moderating effects of altruism on knowledge sharing behavior.

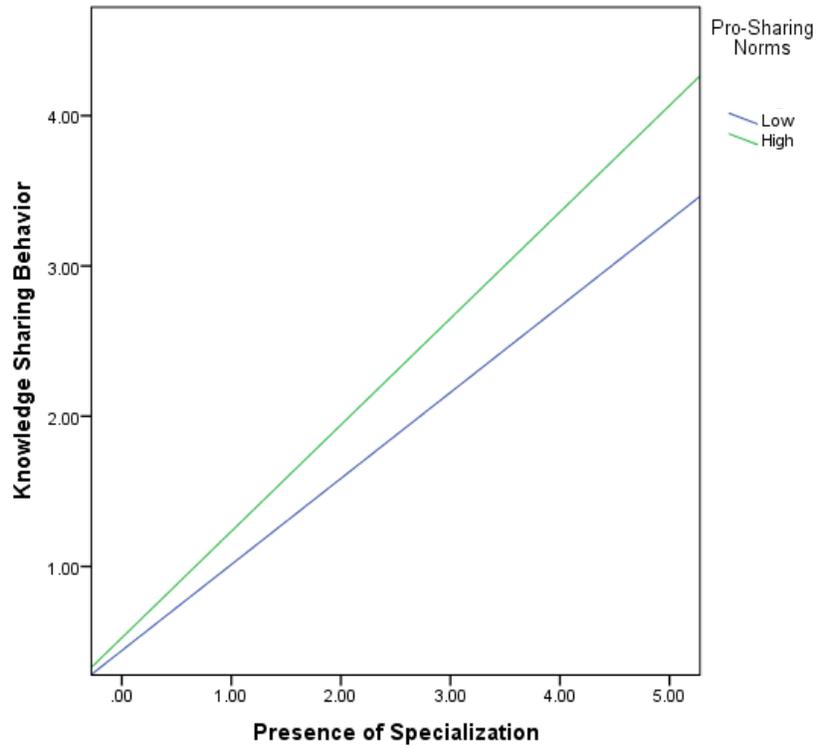


Figure – 8: Interaction Plot, Perceptions of Pro Sharing Norms Vs Presence of Specialization on Knowledge Sharing Behavior

Figure – 8 displays the interacting effect of Pro-Sharing Norms on Knowledge Sharing Behavior. When levels of Pro-Sharing Norms are low, knowledge sharing behaviors are lowered and, increase when Pro-Sharing Norms within the work group are high.

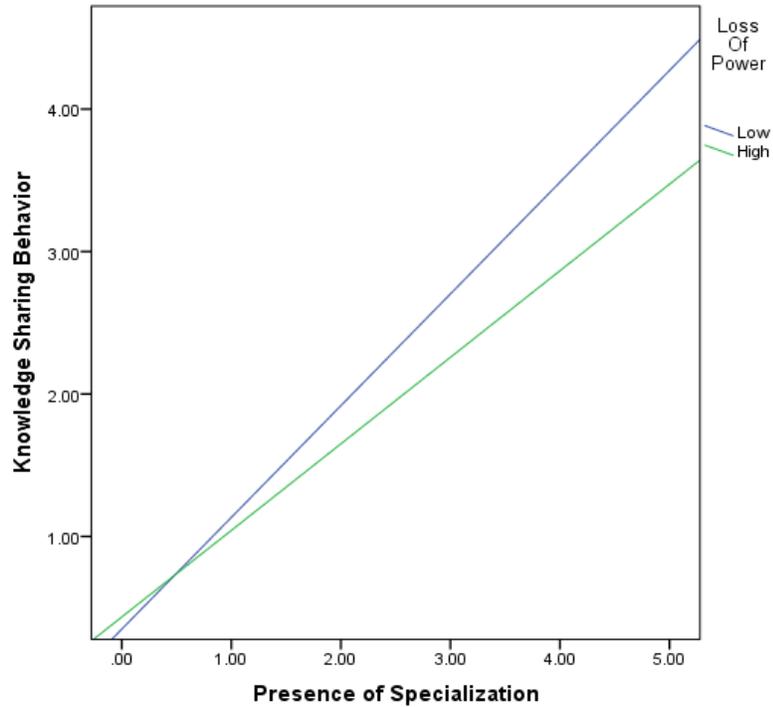


Figure – 9: Interaction Plot, Perceptions of Loss of Power Vs Presence of Specialization on Knowledge Sharing Behavior

Figure – 9 displays the interacting effect of Loss of Power on Knowledge Sharing Behavior. When perceptions of Loss of Power are low, knowledge sharing behaviors are higher and, knowledge sharing behaviors are lowered when Loss of Power within the work group are high.

Discussion

This research investigated factors influencing knowledge sharing behaviors among IT professionals. Important factors influencing knowledge sharing behavior in this study were Presence of Specialization, Perceptions of Justice and Evaluation Apprehension. Other factors such as Pro sharing Norms, Loss of Power and Altruism have been investigated in prior research. Our investigation also tested the moderation effects of these factors on the relationship between Presence of Specialization and Knowledge Sharing Behavior. Overall, we found support for eight of the eleven hypotheses proposed in our study and the findings tell us that sharing specialized knowledge is contingent upon several factors emphasizing the need to understand the phenomenon of knowledge sharing from multiple theoretical perspectives.

Our findings indicate that presence of Specialization is a strong predictor of knowledge sharing behaviors among IT professionals. Our results are consistent with the findings and explanations provided in prior literature from diverse theoretical perspectives such as coordination (Faraj and Sproull, 2000; Wasko and Faraj, 2005) and Transactive Memory Systems (Lewis, 2003). The importance of this finding arises from the fact that presence of specialization perhaps is a primary antecedent determining knowledge sharing behavior since, without the required specialization, individuals may not be able to share any knowledge with others even though other factors enabling knowledge sharing may be present in the work group environment.

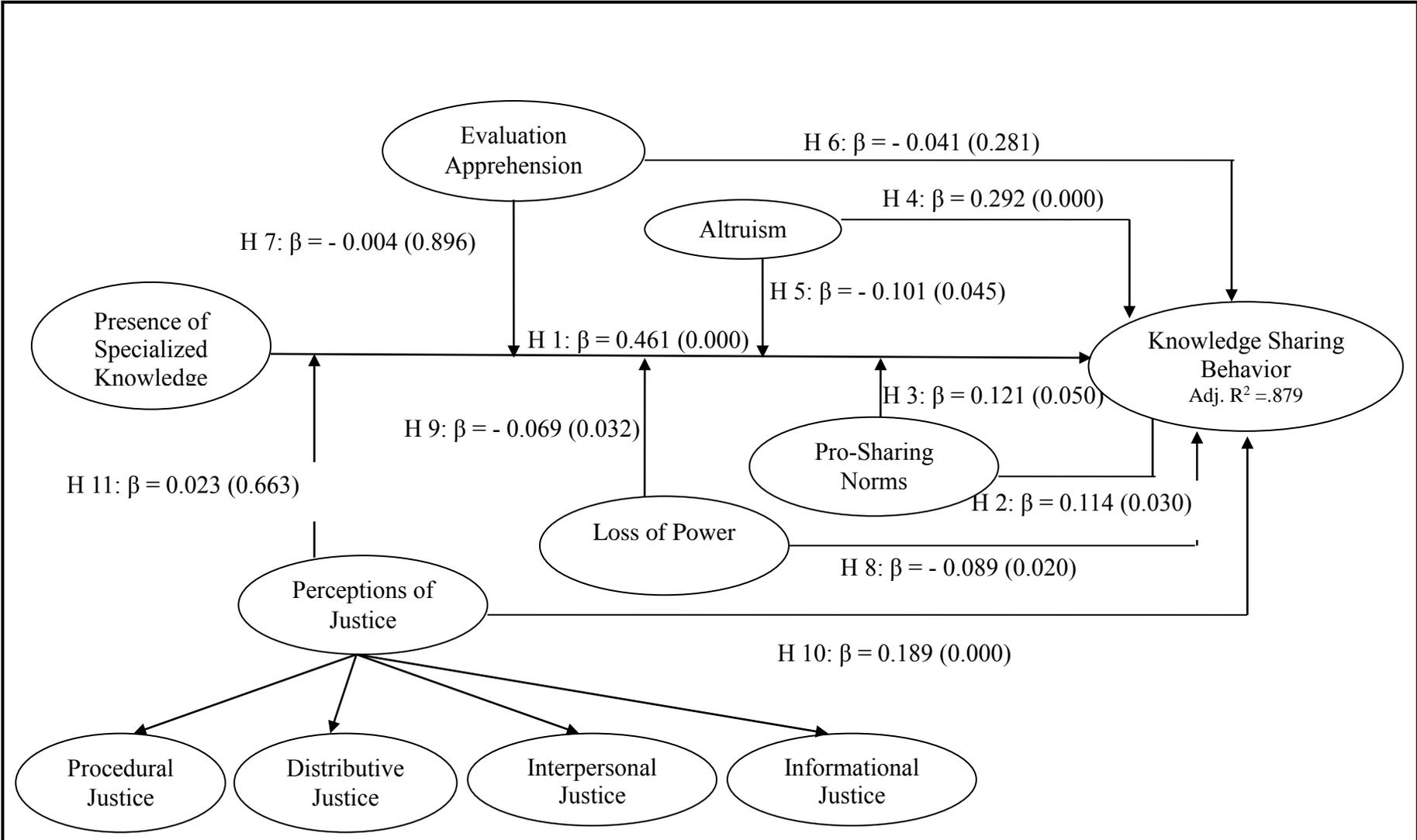


Figure - 10: Final Model

Kankanhalli et al (2005) found that loss of power was not a significant factor among individuals contributing specialized knowledge to Electronic Knowledge Repositories (EKRs). They believe that individuals' actions of contributions are voluntary therefore, they did not perceive this to be a loss of power. The findings in our study, contradict these findings with loss of power being significant for both direct and indirect effects. This could be due to the difference between the contexts of the two studies. As reasoned by Kankanhalli et al (2005), when individuals contribute to EKRs, individuals' feel they're in control over what they contribute freely and can withhold what they do not want to contribute since, the contribution is voluntary. Whereas, within the work group context, individuals may perceive a lack of control over what they share, increasing perceptions of loss of power in face-to-face situations. Our findings support the larger body of KM literature (Orlikowski, 1993, Davenport and Prusak, 1998 and Gray, 2001) which recognizes loss of power as an important barrier to knowledge sharing behavior.

Among the other barriers considered in this study, an important finding was that evaluation apprehension was not a significant barrier. This finding contradicts our belief that individuals would withhold their knowledge due to their negative perceptions of what others think about their contributions. Though our study confirms the negative relationship between evaluation apprehension and knowledge sharing behavior, both, the direct and moderating effects were not significant. We believe that this could be due to the fact that we tested both presence of specialization and evaluation apprehension in the same study. Consistent with general logic, individuals who are experts would normally be less apprehensive about sharing their knowledge since, they're aware of the knowledge

overlaps and gaps between the contributor and receiver within the work group perhaps, due to the development of Transactive Memory Systems within the work group as theorized by Wegner (1987) and Hollingshead (1998).

Our finding a negative relationship between evaluation apprehension and knowledge sharing behavior indicates that individuals may share their knowledge with others who do not give rise to such give rise to such apprehensions. This has important implications for practice in providing a mechanism for reducing inhibitions towards sharing knowledge.

With respect to the influence of perceptions of justice, our hypothesis for the direct influence was supported whereas the moderating effect of perceptions of justice and presence of specialization was not significant. Our findings supports the findings of Bock et al. (2005) whose hypothesis that an organizational climate characterized by fairness, innovation and affiliation would increase norms for sharing knowledge and intention to share knowledge.

Our findings with respect to the four first order factors of justice are interesting. Only Informational Justice and Interactional Justice were found to have a direct effect on knowledge sharing behavior whereas Distributive Justice and Informational Justice were not significant. The interaction effects of all four justice factors were not significant either.

The findings perhaps imply that, in the context of sharing knowledge, when information required for task completion is shared among members of the work group and when other relational aspects of social exchanges such as trust, reciprocity, communication exist (Turner and Makhija, 2006; Sabherwal, 2007; Kirsch et al 2010), individuals may be positively disposed towards sharing their knowledge, due the development of subjective norms and a favorable organizational climate towards knowledge sharing (Brock, et al, 2005). Distributive Justice and Procedural Justice on the other hand operate on the administrative aspects in work groups and superior, subordinate relationships. Therefore, we believe that that these factors would not be directly related to knowledge sharing behavior.

Prior to Greenberg's (1990, 1993) conceptualization of interactional justice as two distinct dimensions, interpersonal justice and informational justice, interactional justice broadly captured the subordinates' perceptions of quality of treatment by their supervisors. Our finding is consistent with prior literature (e.g., Colquitt, 2001; Colquitt et al, 2001; Colquitt & Shaw, 2005) on justice perceptions. First, we found empirical support for the four factors of justice perceptions to be distinct. Second, consistent with prior literature, only informational justice, representing the fairness of explanations provided by supervisors and interpersonal justice representing the treatment of supervisors in terms of respect and dignity were found to influence knowledge sharing behavior. Clearly, this emphasizes the importance of relational aspects on knowledge sharing behaviors in social contexts, complementing other theoretical perspectives on knowledge sharing behavior.

Altruism had a strong significant effect on knowledge sharing behavior in our study. This result is consistent with findings in prior literature (Ba et al, 2001; Osterloh and Frey, 2000; Wasko and Faraj, 2000). The moderating effect of altruism on presence of specialization was also significant supporting both our hypotheses on altruism.

Based on the framework for emotions by Beaudry and Pinsonneault (2010), our findings with respect to altruism, loss of power and evaluation apprehension provide an insight into the influence of emotions and knowledge sharing behavior. We find that both achievement emotions (enjoyment e.g. altruism) and deterrence emotions (fear e.g. loss of power, evaluation apprehension) maybe related to knowledge sharing behavior, drawing our attention to emotional influences on knowledge sharing behaviors that may exist within such contexts.

Implications for Research

This research contributes to prior research in several ways. To the best of our belief, this study is the first to examine the influence of the presence of specialized knowledge as a necessary condition for knowledge sharing behavior at the individual level. Our finding strong support for the presence of specialization as an important antecedent draws our attention to examining this antecedent in future studies.

Investigating the phenomenon of knowledge sharing behavior by including the presence of specialization as an antecedent along with other factors provides a more accurate assessment of the influence of other factors influencing knowledge sharing

behavior. This study we believe, offers a better understanding of knowledge sharing behavior since we included the presence of specialization and also tested for the moderating influence of contextual factors on the relationship between presence of specialization and knowledge sharing behavior thereby contributing to research in multiple ways.

Second, we contribute to prior literature by examining the influence of perceptions of justice at two levels; as four first order factors and as second order factor. The results provide an empirical basis for understanding what factors operate in the context of knowledge sharing. By examining their influence, this research contributes to our better understanding of the phenomena of knowledge sharing behavior from the equity or justice perspective.

A third and important contribution is the examination of the evaluation apprehension as an antecedents of knowledge sharing behavior, from the perspective of emotions which has not been examined in prior IS research. Finally, by adopting a contingency approach in examining several predictors of knowledge sharing behavior examined in prior literature along with the factors identified above, this research contributes towards theory building efforts and provides a better understanding of the favorable and unfavorable conditions influencing knowledge sharing behavior.

Implications for Practice

The implications for practice arising from this research are several. First, practitioners must recognize the interplay of several factors facilitating or inhibiting knowledge sharing behavior in their organizations and sensitize members to them.

Second, in our study, perceptions of justice was a strong predictor of knowledge sharing behavior therefore, in order to increase higher levels of knowledge sharing, organizations must develop and implement strategies to create higher levels of perceptions of justice among their employees. Organizations must promote and support initiatives for developing and implementing policies for ensuring clear and transparent communication among and within work groups in their organizations.

Third, our finding significance for relationship between interpersonal justice and informational justice and knowledge sharing behavior implies that organizations must sensitize IT professionals towards the interactional aspects in social contexts. More specifically, an environment favorable towards mutual respect and dignity along with fairness in communications must be encouraged since these would not only help in reducing counterproductive work behavior but, also enhance knowledge sharing behaviors.

Third, as recommended in prior literature (Kankanhalli et al, 2005) organizations must promote knowledge sharing behavior as an enjoyable activity and recognize individuals who share their knowledge by creating rewards and recognition programs.

Limitations

This study has several limitations and the findings in this study must be interpreted in the context of these limitations. First, all limitations that apply to studies employing survey research apply to this study. Second, the cross sectional research designs and data collection procedures do not provide any causal direction or temporal sequence of the variables examined in the hypothesized relationships. Therefore, no causal inferences can be made.

Third, data collected in this study were self-reported responses from individuals consequently, data collected via self-reports and a common method are not free from common method bias (Podaskoff and Orgon, 1986). Though we tested for common method bias and found that common method bias was not a threat in this study, inferences made from this study need to take into consideration issues related to bias arising from such data.

Fourth, Social desirability bias cannot be ruled out in self-reported data consequently, our results and model estimates may be inflated due to social desirability biases arising from self-reported responses.

Fifth, we restricted our sample to American IT professionals, therefore generalization to IT professionals from other cultures may be limited and needs to be examined separately. Lastly, though we made all attempts to obtain a random sample, practical considerations and limitations restrict the extent to which a perfectly random sample can be obtained. Therefore, we suggest that the sample obtained is more of a convenience sample therefore, inferences made from the study must take into account such limitations.

Directions for Future Research

This study makes an important contribution to future research on knowledge sharing behavior by including the presence of specialization as a pre-condition for knowledge sharing behavior. Future research can build on this contribution by examining the influence of other factors not examined in this study, along with the presence of specialization.

Second, we examined the influence of justice perceptions on knowledge sharing behavior and found that overall justice perceptions was a good predictor of knowledge sharing behavior. Since, prior research has found that justice perceptions influence other behaviors in the work environment (e.g. Holtz and Harold, 2013). Future research may examine whether justice perceptions influence other factors associated with knowledge sharing as well.

We examined the moderating effects of individual and contextual factors on the relationship between presence of specialization and knowledge sharing behavior. Future research may examine the moderating effects of other factors not considered in this study.

We acknowledge that it is possible that there may be both moderating and mediating effects of several factors on knowledge sharing behavior e.g. pro-sharing norms may mediate the relationship between perceptions of justice and knowledge sharing behavior in our research model. While we did not test any mediating relationships in this study, future research can examine the influence of both mediation and moderation.

Conclusions

The purpose of this study was to examine factors influencing knowledge sharing behavior among IT professionals. We developed and tested a research model employing concepts and measures drawn on prior literature. Eleven hypotheses were tested and eight hypotheses were supported. To the best of our knowledge, this study is the first to specifically examine the influence of three concepts on knowledge sharing behavior in IS literature: perceptions of justice, presence of specialization and evaluation apprehension among American IT professionals.

Appendices

Appendix – A: Survey Instrument Knowledge Sharing Behavior Survey

An Empirical Investigation of Factors Influencing IT Professionals' Knowledge Sharing Behavior in Organizations

Knowledge sharing in organizations is critical for enhancing firm performance, competitiveness and innovation. This study aims to investigate the key factors that influence knowledge sharing behaviors of Information Technology (IT) professionals in organizations. Your participation in this survey will help in better understanding the factors that influence knowledge sharing and provide insights for effective knowledge management in organizations.

Your participation in this research is *voluntary*. Respondents are *not* required to provide any identifiable information. All responses provided in this survey will be kept *confidential* and *anonymous*. Only the overall results of the study will be published.

We request you to respond to all questions. The entire survey should take you between 15 and 20 minutes.

We greatly appreciate your participation in the survey and thank you for your valuable time and input!

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Background Questions

1. Job title: _____
2. Organization: _____
3. Total IT experience: _____ Years.
4. How long have you worked in this organization? _____ Years _____
Months.
5. How long have you worked in the current work group? _____ Years _____
Months.
6. Your gender: _____ Male _____ Female
7. Please indicate your age:

20 – 25	_____	26 – 30	_____	31 – 35	_____	36 – 40
41 - 45	_____	45 - 50	_____	50 - 55	_____	55 +

8. Please indicate the type/s of Information Systems development (ISD) activities carried out by you (select all categories that apply):

Systems	_____	Systems	_____	Programming/development
Testing	_____	Maintenance	_____	Others (please specify)

9. Highest education level attained:

Doctorate	_____	Master Degree	_____	Bachelors
Diploma	_____	Others (please specify)		

10. Where did you obtain your first college degree? _____ US _____ Canada _____ India
_____ Others

11. Please indicate the size of your organization:

Less than 100	_____	100 – 500	_____	500 – 1000
1000 – 5000	_____	More than 5000	_____	Others (please

12. How many members are there in your work group? _____

13. Name of your work group: _____

14. Please indicate your ethnicity (alphabetically ordered):

_____ African	_____ Asian	_____ Hispanic
_____ South Asian	_____ White	_____ Other (please

Continued on next page

Please answer all questions with reference to your main work group.

Please refer to the procedures used to make decisions about pay, rewards, evaluations, promotions, assignments, etc. in your main work group by selecting the most suitable response to each of the following statements.

Please select your response based on the following scale:					
1=Strongly Agree, 2= Agree, 3= Neutral, 4= Disagree, 5=Strongly Disagree					
		Strongly Agree	Neutral	Strongly Disagree	
1	Are you able to express your views during those procedures?	1	2	3	4 5
2	Can you influence the decisions arrived at by those procedures?	1	2	3	4 5
3	Are those procedures applied consistently?	1	2	3	4 5
4	Are those procedures free of bias?	1	2	3	4 5
5	Are those procedures based on accurate information?	1	2	3	4 5
6	Are you able to appeal the decisions arrived at by those procedures?	1	2	3	4 5
7	Do those procedures uphold ethical and moral standards?	1	2	3	4 5
8	Do those outcomes reflect the effort you have put into your work?	1	2	3	4 5
9	Are those outcomes appropriate for the work you have completed?	1	2	3	4 5
10	Do those outcomes reflect what you have contributed to your work?	1	2	3	4 5
11	Are those outcomes justified, given your performance?	1	2	3	4 5

12	Has your supervisor treated you in a polite manner?	1	2	3	4	5
13	Has your supervisor treated you with dignity?	1	2	3	4	5
14	Has your supervisor treated you with respect?	1	2	3	4	5
15	Has your supervisor refrained from improper remarks or comments?	1	2	3	4	5
16	Has your supervisor been candid when communicating with you?	1	2	3	4	5
17	Has your supervisor explained decision-making procedures thoroughly?	1	2	3	4	5
18	Were your supervisor's explanations regarding procedures reasonable?	1	2	3	4	5
19	Has your supervisor communicated details in a timely manner?	1	2	3	4	5
20	Has your supervisor tailored communications to meet individuals' needs?	1	2	3	4	5

The following set of statements are related to your knowledge sharing in your main work group. Please select the most suitable response to each of the statements below.

Please select your response based on the following scale:								
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree								
		Strongly Agree		Neutral			Strongly Disagree	
1	I often contribute my knowledge to others in my work group.	1	2	3	4	5	6	7
2	I regularly contribute my knowledge to others in my work group.	1	2	3	4	5	6	7
3	I often help others in my work group who need information.	1	2	3	4	5	6	7

4	I contribute my knowledge to others in my work group to help in the development of new insights.	1	2	3	4	5	6	7
---	--	---	---	---	---	---	---	---

The next set of statements are related to your main work group. Please select the most suitable response to each of the statements below.

Please select your response based on the following scale:						
1=Strongly Agree, 2= Agree, 3= Neutral, 4= Disagree, 5=Strongly Disagree						
		Strongly Agree		Neutral		Strongly Disagree
1	In my work group, there is a lot of team spirit among the members.	1	2	3	4	5
2	In my work group, members know that they can depend on each other.	1	2	3	4	5
3	In my work group, members stand up for one another.	1	2	3	4	5
4	In my work group, individuals pitch in to help one another.	1	2	3	4	5
5	In my work group, members take interest in one another.	1	2	3	4	5
6	In my work group, members regard each other as friends.	1	2	3	4	5
7	In my work group, members are very cooperative with one another.	1	2	3	4	5
8	In my work group, members work as a team.	1	2	3	4	5

The next set of statements are related to your feelings about your main work group. Please select the most suitable response to each of the statements below.

Please select your response based on the following scale:						
1=Not at all characteristic of me, 2= Slightly characteristic of me, 3=Moderately characteristic of me, 4=Very characteristic of me, 5=Extremely characteristic of me						
1	I'm afraid that others in my work group will not approve of what I say or contribute	1	2	3	4	5

2	I'm afraid that other people in my work group will find fault with my actions	1	2	3	4	5
3	When I'm talking to someone in my work group, I worry about what they may be thinking about me	1	2	3	4	5
4	I'm usually worried about what kind of impression I make on others in my work group.	1	2	3	4	5
5	Sometimes I think I'm too concerned about what other people in my work group think of me	1	2	3	4	5
6	I often worry that I will say or do the wrong things at work	1	2	3	4	5

The next set of statements are related to your work environment. Please select the most suitable response to each of the following statements below.

Please select your response based on the following scale:								
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree								
		Strongly Agree		Neutral			Strongly Disagree	
		1	2	3	4	5	6	7
1	There is a norm of cooperation in my work group.	1	2	3	4	5	6	7
2	There is a norm of collaboration in my work group.	1	2	3	4	5	6	7
3	There is a norm of team work in my work group.	1	2	3	4	5	6	7
4	There is a willingness to value and respond to diversity in my work group.	1	2	3	4	5	6	7
5	There is a norm of openness to conflicting views in my work group.	1	2	3	4	5	6	7
6	There is a norm of tolerance to mistakes in my work group.	1	2	3	4	5	6	7

Continued on next page

This section relates to your knowledge and skills with respect to Information Systems (IS) activities in your organization. Please select the most suitable response to each of the statements below.

Please select your response based on the following scale:								
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree								
		Strongly Agree		Neutral			Strongly Disagree	
		1	2	3	4	5	6	7
1	I have the ability to provide unique knowledge of value to others in my work group.	1	2	3	4	5	6	7
2	I have the expertise needed to provide valuable knowledge to others in my work group.	1	2	3	4	5	6	7
3	I have knowledge about various aspects of my work that other members in my work group do not have.	1	2	3	4	5	6	7
4	I have the required expertise for executing tasks in my work group.	1	2	3	4	5	6	7

The following statements are related to your activities in your main work group. Please select the most suitable response to each of the statements below.

Please select your response based on the following scale:								
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree								
		Strongly Agree		Neutral			Strongly Disagree	
		1	2	3	4	5	6	7
1	I enjoy sharing my knowledge with others in my work group.	1	2	3	4	5	6	7
2	I enjoy helping others by sharing my knowledge in my work group.	1	2	3	4	5	6	7
3	It feels good to help others by sharing my knowledge in my work group.	1	2	3	4	5	6	7
4	Sharing my knowledge with others in my work group gives me pleasure	1	2	3	4	5	6	7

Continued on next page

The next set of statements that are related to your work environment. Please select the most suitable response to each of the following statements below.

Please select your response based on the following scale:									
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree									
		Strongly Agree			Neutral		Strongly Disagree		
		1	2	3	4	5	6	7	
1	Group welfare is more important than individual rewards.	1	2	3	4	5	6	7	
2	Group success is more important than individual success.	1	2	3	4	5	6	7	
3	Being accepted by members of your work group is very important.	1	2	3	4	5	6	7	
4	Employees should only pursue their goals after considering the welfare of the group.	1	2	3	4	5	6	7	
5	Managers should encourage group loyalty even if individual goals suffer.	1	2	3	4	5	6	7	
6	Individuals may be expected to give up their goals in order to benefit group success.	1	2	3	4	5	6	7	

The following statements are related to your activities in your main work group. Please select the most suitable response to each of the statements below

Please select your response based on the following scale:									
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree									
		Strongly Agree			Neutral		Strongly Disagree		
		1	2	3	4	5	6	7	
1	Managers should make most decisions without consulting subordinates.	1	2	3	4	5	6	7	
2	It is frequently necessary for a manager to use authority and power when dealing with subordinates.	1	2	3	4	5	6	7	
3	Managers should avoid off-the-job social contacts with employees.	1	2	3	4	5	6	7	

4	Employees should not disagree with management decisions.							
5	Managers should seldom ask for the opinions of employees							
6	Managers should not delegate important tasks to employees.	1	2	3	4	5	6	7

Continued on next page

The following statements are related to your perceptions of the consequences of sharing knowledge in your main work group. Please select the most suitable response to each of the statements below

Please select your response based on the following scale:								
1=Strongly Agree, 2= Agree, 3=Somewhat Agree, 4= Neutral, 5= Somewhat Disagree, 6= Disagree, 7=Strongly Disagree								
		Strongly Agree		Neutral			Strongly Disagree	
1	Sharing my knowledge makes me lose my unique value in the organization.	1	2	3	4	5	6	7
2	Sharing my knowledge makes me lose my power base in the organization.	1	2	3	4	5	6	7
3	Sharing my knowledge makes me lose my knowledge that makes me stand out with respect to others.	1	2	3	4	5	6	7
4	Sharing my knowledge makes me lose my knowledge that no one else has.	1	2	3	4	5	6	7

Please share your feedback and opinions about any salient factors that influence your knowledge sharing behavior.

The results of the study will be available to participants. If you wish to obtain a copy of the results, please provide an Email ID. The email id provided by you will be kept confidential and used only for the purpose of emailing the results.

Email ID: _____

Appendix – B: IRB Approval



Office of Research Administration

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DATE: November 15, 2012

TO: Prasad Rudramuniyaiah, M.Sc.
FROM: University of Missouri-St. Louis IRB

PROJECT TITLE: [348661-3] An Empirical Investigation of Factors Influencing IT Professionals' Knowledge Sharing Behavior in Organizations

REFERENCE #:
SUBMISSION TYPE: Amendment/Modification

ACTION: MODIFICATIONS APPROVED
DECISION DATE: November 15, 2012
EXPIRATION DATE: July 5, 2013
REVIEW TYPE: Full Committee Review

This modification was approved by the University of Missouri-St. Louis IRB for the term of this protocol. The University of Missouri-St. Louis IRB must be notified in writing prior to major changes in the approved protocol. Examples of major changes are the addition of research sites or research instruments.

An annual report must be filed with the committee. This report should indicate the starting date of the project and the number of subjects since the start of project, or since last annual report.

Any consent or assent forms must be signed in duplicate and a copy provided to the subject. The principal investigator must retain the other copy of the signed consent form for at least three years following the completion of the research activity and they must be available for inspection if there is an official review of the UM-St. Louis human subjects research proceedings by the U.S. Department of Health and Human Services Office for Protection from Research Risks.

This action is officially recorded in the minutes of the committee.

If you have any questions, please contact Carl Bassi at 314-516-6029 or bassi@umsl.edu. Please include your project title and reference number in all correspondence with this committee.

Appendix – C: AMOS CFA Output**Model Fit Summary****CMIN**

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	118	863.650	548	.000	1.576
Saturated model	666	.000	0		
Independence model	36	6532.488	630	.000	10.369

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.062	.818	.779	.673
Saturated model	.000	1.000		
Independence model	.556	.164	.116	.155

Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	.868	.848	.947	.939	.947
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.870	.755	.823
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	315.650	239.701	399.526
Saturated model	.000	.000	.000
Independence model	5902.488	5646.349	6165.121

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	4.234	1.547	1.175	1.958
Saturated model	.000	.000	.000	.000
Independence model	32.022	28.934	27.678	30.221

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.053	.046	.060	.219
Independence model	.214	.210	.219	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	1099.650	1151.938	1491.765	1609.765
Saturated model	1332.000	1627.114	3545.125	4211.125
Independence model	6604.488	6620.440	6724.117	6760.117

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	5.390	5.018	5.802	5.647
Saturated model	6.529	6.529	6.529	7.976
Independence model	32.375	31.119	33.662	32.453

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	143	149
Independence model	22	23

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