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What is This?

Learning Task Effectiveness and Social Interdependence Through the Mediating Mechanisms of Sharing and Helping: A Survey of Online Knowledge Workers

Chieh-Peng Lin[1]

Abstract

This study proposes a model by postulating antecedents and mediators related to interemployee linkages as the key drivers of task effectiveness, in which task effectiveness is affected indirectly by expressiveness, outcome, and task interdependence through the mediation of knowledge sharing and interemployee helping. This study conducts empirical testing of the proposed model by investigating online knowledge workers from business organizations in Taiwan and confirms the applicability of interemployee linkages in understanding task effectiveness. This study contributes to the literature related to job effectiveness by validating idiosyncratic drivers of interemployee helping and by performing an operationalization of social interdependence. Lastly, managerial implications and limitations of the research are provided.

Keywords

task effectiveness, interdependence, helping, sharing

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Dramatic advances in information technology (IT) today enable new methods of working or collaboration among knowledge workers, and the novel opportunity provided by such advanced IT and the increasingly intense competition facing knowledge workers have led many to take advantage of virtual organizations (Bell & Kozlowski, 2002; Gwebu, Wang, & Troutt, 2007). Whereas knowledge workers are defined as persons with the motivation and capacity to create new insights and to communicate, coach, and facilitate the implementation of new ideas (Horwitz et al., 2006; Horwitz, Heng, & Quazi, 2003), virtual organizations refer to organizations in which their knowledge workers use tools such as email, Usenet news, discussion boards, listservs, and group support systems to effectively facilitate their work or collaboration with online others in such organizations. Given that early studies of task effectiveness mainly focused on the issues of blue-collar work (H. D. Yang, Kang, & Mason, 2008), this study attempts to address the issues facing knowledge workers. This is important because research results related to an organization may be sensitive to the context of the organization and its workers (H. D. Yang et al., 2008). Thus, this study investigating knowledge workers should enable better understanding of their task effectiveness.

Numerous research points to substantial emphasis on employees' mutual interactions in job contexts, substantially suggesting that managers widely regard employees' workplace sharing and helping as key factors for task effectiveness (e.g., Oosterhof, Van der Vegt, Van de Vliert, & Sanders, 2009). Successful organizations, particularly virtual ones, count heavily on their knowledge workers sharing with and helping others, which synthesize the workers' competitive advantage and efforts in these organizations. Previous research has emphasized a greater importance for online knowledge workers than for traditional workers regarding the effectiveness of online health services in delivering a wide range of mutual-help facilities (i.e., interpersonal helping) as well as direct counseling (Mallen & Vogel, 2005). Because the online world has broken down all traditional and regional borders, new opportunities for efficient interemployee helping (or knowledge sharing) in virtual organizations are greatly expanded (e.g., Gackenbach, 1998). As an organization is often assembled to take on complex and multifaceted endeavors, tasks in the organization present a range of knowledge-intensive challenges to organizational members (Noe, Colquitt, Simmering, & Alvarez, 2003). As such, scholars have theorized that greater workplace sharing and helping by the members should translate into better task effectiveness, as long as what is being shared is relevant (Hirschfeld, Jordan, Feild, Giles, & Armenakis, 2006). More specifically, organizations that successfully promote knowledge sharing and interemployee helping not only can incorporate

quality knowledge in their business strategy, but also can strengthen employees' mutual help, consequently leading to enhanced task effectiveness.

Note that task effectiveness is an individual level variable that refers to whether individuals perform their task effectively (Campbell, McCloy, Oppler, & Sager, 1993; S. G. Cohen & Bailey, 1997). Coming from a psychological aspect, Campbell et al. (1993) describe job effectiveness as an individual level variable. Specifically, task effectiveness (or job effectiveness) is something a single person does (Campbell et al., 1993), which differentiates itself from more encompassing factors such as team effectiveness or organizational effectiveness, which are higher level variables (Campbell et al., 1993; S. G. Cohen & Bailey, 1997; Stewart & Johnson, 2009; Tekleab, Quigley, & Tesluk, 2009).

Previous research has often examined knowledge sharing or interpersonal helping from two major aspects: (a) employees' personal belief structures such as self-efficacy, self-interest, trust, and so on and (b) institutional structures such as norms, codes, and practices, which instrumentally shape individuals' belief structures (Bock, Zmud, Kim, & Lee, 2005). Examples of theories from the above two aspects include social networks theory (Luo & Hassan, 2009), theory of reasoned action (Hsu & Lin, 2008), theory of planned behavior, self-determination theory (Gagné, 2009), and social capital theory (Noe et al., 2003). These theories have provided reasonable explanations for why and how people perform knowledge sharing and interpersonal helping. Nevertheless, social interdependence that is beyond merely either employees' personal belief structures or institutional structures has drawn relatively little attention in the previous research. Although it is logical to expect team members' social interdependence to be a predictor of task effectiveness, previous studies failed to provide clear evidence of the hypothesized relationship between such social interdependence and task effectiveness. This lack of empirical evidence may be because of the adoption of specific theoretical and methodological approaches (e.g., personality theory) that constrain our understanding about the formation of task effectiveness. Hereby this study complements previous research from an aspect of social interdependence. Social interdependence theory suggests that individuals' beliefs about how different people's goals are related in their institution determine the way these individuals interact, which in turn affects their task effectiveness (M. D. Johnson, 2006).

Even though plenty of discussion about the two mechanisms of helping and sharing has been dispersed across different research areas (e.g., Jackson & Tisak, 2001; Mergel, Lazer, & Binz-Scharf, 2008), a model that explores task effectiveness from a theoretical aspect of social interdependence by simultaneously considering both mechanisms has rarely been examined

(Siemsen, Balasubramanian, & Roth, 2007). For that reason, this study derives two research questions of interest: (a) How can sharing and helping mechanisms be appropriately applied to understanding task effectiveness based on social interdependence? (b) What critical antecedents drive such mechanisms and how? Exploring these research questions is important, because an improved understanding of task effectiveness and its determinants can help management push critical leverages on the right determinants of task effectiveness through effective measures or policies.

This study differs from previous research in two major points. First, it assesses how different types of interpersonal linkages in an organization—those related to interdependence, knowledge sharing, and interemployee helping—influence optimal task effectiveness in the organization. Although the importance of interpersonal linkages in the context of organizational behavior has been somewhat discussed in previous research, a systematic analysis is lacking for how task effectiveness within organizations can be substantially boosted when management takes advantage of each specific linkage and combination. This study addresses such a gap.

Second, although organizational behavior research has been widely performed within the context of personal, face-to-face social relationships, there is increasing evidence that employees are applying IT in virtual settings to execute their organizational tasks, which may be comparable to that in face-to-face settings (Griffith, Sawyer, & Neale, 2003). Although task performance in organizations is more and more supported by IT (Lainema & Lainema, 2008), organizational behavior research is somewhat insufficient based on virtual settings (e.g., Internet working environment). Consequently, this study is one of the few to examine task effectiveness in organizations by empirically testing a model with a survey of online knowledge workers in business organizations.

The rest of this article is organized as follows. The next section describes the theoretical underpinnings of the social interdependence and formulates a research model of task effectiveness based on such interdependence. The third section then presents the research methods used in the study, including the choice of empirical context, subject sample, and instrumentation. The fourth section then describes the data analysis procedures and empirical results. The fifth section outlines the implications of the findings in this study. Finally, the sixth section indicates the limitations of the study and future research.

Theory and Conceptual Framework

The theory of social interdependence holds that when employees share goals and their outcomes are influenced by the actions of others, the goals can be

designed to promote interdependence, interemployee linkages, and other consequences (Siemsen et al., 2007). Central to this theory is the categorization of situations that create knowledge sharing or interemployee helping orientations. When situations are structured interdependently, employees perceive that their goals are positively related to those of other employees in the situations (M. D. Johnson et al., 2006), ultimately strengthening knowledge sharing and interemployee helping among employees. The situations can be structured in which interdependent incentive and compensation systems are embedded (Siemsen et al., 2007), because previous literature has indicated that a reward and task structure could interact to ultimately yield superior task effectiveness (Wageman, 1995). It is supported that the fit between the design of the incentive system and the nature of interemployee linkages can determine the success of that system (e.g., task effectiveness; Wageman, 1995).

Drawing on the perspective of social interdependence and interemployee linkages (e.g., Siemsen et al., 2007), this study first proposes a conceptual framework. In the proposed framework, outcome and expressiveness linkages among online knowledge workers (e.g., Tse & Dasborough, 2008) positively lead to sharing and helping linkages which eventually bring about the task effectiveness of the workers. The rationale of the conceptual framework can be seen via two steps as follows.

First, outcome and expressiveness linkages call for interdependent aid and understanding among organizational members so that organizational activities are synchronized properly and organizational tasks can be conducted well (e.g., Jourdain, 2004; Siemsen et al., 2007; Van de Bunt, Wittek, & de Klepper, 2005). Organizations often face difficulties in encouraging their employees to share their knowledge with others, because sharing personal knowledge such as insights and ideas with one's coworkers may carry a cost for some individuals, which may yield a dilemma of their knowledge sharing (A. Cabrera & Cabrera, 2002). For that reason, interdependence that represents a principle of being mutually and physically responsible to and sharing common goals with others becomes critical for facilitating knowledge sharing and interemployee helping. Personal reciprocal interdependence of work creates a strong incentive for employees to work together to achieve common goals (E. F. Cabrera & Cabrera, 2005). Thus, knowledge sharing and interemployee helping among organizational members become strong, given the high interdependency among the members (Noe et al., 2003).

Second, sharing and helping linkages call for mutual support and cooperation among organizational members, such that they share knowledge with each other and assist with each other's tasks (Siemsen et al., 2007). Knowledge sharing and interemployee helping have been examined as mediators across various organizational issues in previous research. For instance,

previous literature indicates the role of knowledge sharing as a team process to mediate the relationship between empowering leadership and team performance (Srivastava, Bartol, & Locke, 2006). Another example regarding the mediating role of knowledge sharing and knowledge integration between emergency management task characteristics and performance has been confirmed in a previous work (Becerra-Fernandez, Xia, Gudi, & Rocha, 2008).

Note that the outcome and expressiveness of individuals are likely affected to some extent by those of their peers or coworkers. The outcome and expressiveness linkages in this study can be considered a type of reciprocal dependence, and they are generally consistent with the concept of social interdependence and networks described in some seminal works in the literature (e.g., Manev & Stevenson, 2001; Van Der Vegt, Emans, & Van De Vliert, 2000; Wageman, 1995). They are categorized into three dimensions: outcome, task, and expressiveness interdependence. The three dimensions are proposed by this study because of their distinct features respectively, and they are also used for our hypotheses' development in the next section.

Research Model

Transformed from the above conceptual framework, we further establish a research model (see Figure 1) based on the framework for empirical testing to examine the formation of task effectiveness. More specifically, in the proposed model task effectiveness is influenced indirectly by outcome, task, and expressiveness interdependence through the mediation of knowledge sharing and interemployee helping. The proposed model is theoretically supported by the theory of social interdependence (Siemsen et al., 2007), which indicates that organizational members' affection, tasks, and outcomes are substantially influenced by the actions of others, suggesting the importance of different dimensions of social interdependence herein. Note that the interdependence of outcome, task, and expressiveness has only an indirect influence rather than a direct one on task effectiveness, because such a direct effect is not justifiable. Recent research further confirms the indirect role of task interdependence in affecting performance (e.g., Somech, Desivilya, & Lidogoster, 2009). Indeed, because task effectiveness relates to *getting the right tasks done* (Drucker, 2006), actions such as helping and sharing have a more direct influence on task effectiveness than such social concepts as social interdependence. At any rate, the rationale for the hypotheses indicated in Figure 1 is presented in detail as follows.

Knowledge represents the theoretical or practical understanding of the world which consists of objects, events, facts, information, and so on. Knowledge has become an integral business function for many organizations as
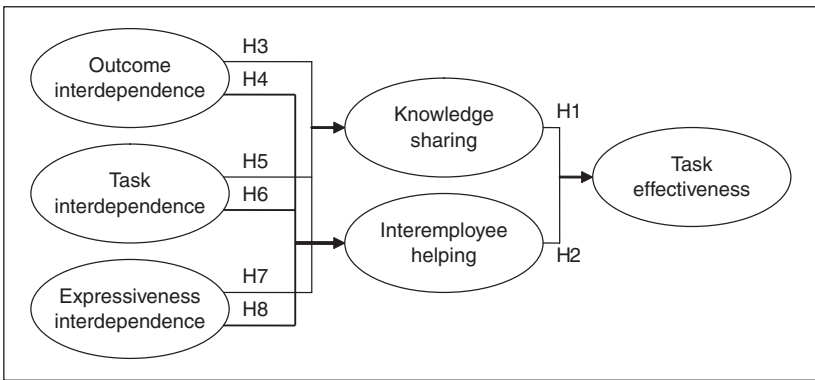
Figure 1. Research model of this study

their competitiveness hinges on effective management of knowledge-based resources (Grover & Davenport, 2001). The richest resource in an organization is the knowledge residing individually and absorbed by employees, which reveals the importance of processes for promoting the sharing and leveraging of knowledge (Becerra-Fernandez & Sabherwal, 2001).

Knowledge sharing is considered to be individuals' willingness to assist as well as to absorb from others the development of new skills or competencies (Bryant, 2005; Lin, 2007a). Whereas task effectiveness in organizations is referred to as a certain synergistic degree in which organizational members perform tasks together, knowledge sharing is a positive force to encourage knowledge exchange, to broaden individuals' professional horizons, and consequently to lead to high effectiveness of brainpower and intellectual capital (Lin, 2008). Particularly, knowledge sharing makes a substantial contribution to the development of core competencies and skills and gradually fosters a sharing environment where organizational members are encouraged to exchange and use their knowledge in problem-solving conditions, leading to increased task effectiveness (Macneil, 2001).

Whereas knowledge increases its added value because of the sharing and transferring of that knowledge to other organizational members (Mir & Mir, 2009; J. T. Yang, 2007), the act of incomplete sharing and transferring of knowledge incurs a so-called organizational knowledge depreciation that brings about organizational task ineffectiveness (Argote, 1999). Because of the huge volume and specialization of information in a competitive world, employees count heavily on others to share information so as to effectively solve their task problems in a timely manner (Argote, 1999; Argote, McEvily, & Reagans, 2003). The positive effect of knowledge sharing on task effectiveness may also

be explained by the optimization of organizational experience, which is seen as the knowledge shared and accumulated by different employees (Gold, Malhotra, & Segars, 2001; Argote, 1999; Argote et al., 2003). In other words, organizational members who are provided with the opportunity to benefit from critical knowledge shared and disseminated by others (i.e., organizational experience) are likely to achieve great task effectiveness (Gold et al., 2001; Reagans, Argote, & Brooks, 2005). Therefore, the hypothesis below is posited.

> *Hypothesis 1:* Knowledge sharing is positively related to task effectiveness.

Interemployee helping is defined as discretionary behaviors to help other co-workers in an organization with relevant tasks or problems (Organ, 1988). Interemployee helping is important for organizational effectiveness, and thus it holds the key to business organizations' competitive advantage (e.g., A. Cohen & Keren, 2008; Lin, 2006). Task effectiveness in organizations can be improved from a learning perspective if experienced employees are able to provide sufficient help for their colleagues to learn from their work experience and to manage diversity and conflict (Bolton, 1999).

Employees who dedicate themselves to helping other employees are important for the task effectiveness of individual members, because such helping reduces, for example, the time taken up by inexperienced employees for exploring something that has been known and familiar to senior employees. Previous research has noted that a helping culture is a top enabler of effective innovation (Rivas & Gobeli, 2005), suggesting the positive relationship between interemployee helping and task effectiveness. The following hypothesis is therefore proposed:

> *Hypothesis 2:* Interemployee helping is positively related to task effectiveness.

Outcome interdependence is the degree to which organizational members are presented with organizational goals and provided with organizational feedback and rewards (Neubert, Taggar, & Cady, 2006). It is impossible to force employees to share knowledge with others (A. Cabrera & Cabrera, 2002; E. F. Cabrera & Cabrera, 2005), because they are rational actors stimulated by reward systems based on the overall tasks they perform (e.g., outcome interdependence). Strong outcome interdependence is found to be associated with strengthened mutual relationships (Tjosvold & Wong, 1991), such as mutual aid, mutual exchange for information, and so forth. In contrast, when

outcome interdependence is low, organizational members are likely thwarted or hindered by others from obtaining sound job performances (Van Der Vegt, Emans, & Van De Vliert, 1998) by, for example, not sharing important message and information. As a result, they experience low responsibility for others' work outcomes (Van Der Vegt et al., 1998) and thus knowledge sharing or interemployee helping is less possible.

An empirical study shows that employees' sense of being "in the same boat" or perceiving outcome interdependence contributes to positive behaviors such as helping and sharing behaviors (Fairfield, Wagner, & Victory, 2004). Thus, employees exchange more tools and resources (i.e., to exchange knowledge and assist with one another; de Cremer, 2003; Van Der Vegt, Emans, & Van De Vliert, 1999). Collectively, when there is positive outcome interdependence, an individual believes that goal attainment by other organizational members facilitates movement toward his or her own goals (Van Der Vegt et al., 1999), acting strongly with knowledge sharing and interemployee helping on his or her own initiative. Hence, two hypotheses are developed and stated as below.

> *Hypothesis 3:* Outcome interdependence is positively related to knowledge sharing.
> *Hypothesis 4:* Outcome interdependence is positively related to interemployee helping.

Task interdependence is the degree to which organizational members count on and interact with one another to perform their tasks (Neubert et al., 2006). Task interdependence increases the chances for personnel to require assistance from others so as to perform their jobs (Van Der Vegt et al., 1999). Increasing the level of task interdependence produces mutual help and cooperation to obtain better performance and efficiency (Van Der Vegt et al., 1999), implying a positive relationship between task interdependence and interemployee helping.

A high level of task interdependence, on the other hand, encourages organizational members to share materials, information, and advice in order to achieve the desired output or long-term performance (Van Der Vegt et al., 1999). In other words, when positive task interdependence predominates, individuals who benefit from good task performance by their peers are likely to emerge with a strong willingness to share knowledge, because knowledge sharing facilitates the transfer of physical, informational, or financial resources in an organization and leads to a coworker's better task performance that eventually benefits himself in return (Lin, 2007b). Empirical support for the value of interdependency in effective knowledge sharing

comes from previous research on knowledge workers that finds a positive relationship between task interdependence and knowledge sharing (E. F. Cabrera & Cabrera, 2005). Collectively, given that task interdependence ameliorates interpersonal interactions among organizational members (Gersick, 1989), the members are likely to help others and share knowledge with others through quality interactions, leading to two hypotheses summarized as follows:

> *Hypothesis 5:* Task interdependence is positively related to knowledge sharing.
> *Hypothesis 6:* Task interdependence is positively related to interemployee helping.

Expressiveness interdependence is derived from interpersonal expressive ties that stand for interpersonal friendship and social support (Manev & Stevenson, 2001). Expressiveness interdependence in this study suggests the degree to which organizational members value their mutual affective relationship, such as social support and friendship with one another. Individuals' affective relationship is positively related to their interpersonal helping (Venkataramani & Dalal, 2007; Toegel, Anand, & Kilduff, 2007), implying a positive association between expressiveness interdependence and interemployee helping. Previous research has indicated that interemployee helping is the outcome of the quality of interdependent relationships among employees, as well as the result of opportunity structures created by social and workflow systems (Venkataramani & Dalal, 2007).

Given that workplace friendships and social support are components of expressive ties (Manev & Stevenson, 2001), organizational members who perceive strong expressiveness interdependence are likely to provide their help to and share their knowledge with other employees who generally offer friendships and social support to them, suggesting that expressiveness interdependence influences knowledge sharing and interemployee helping (e.g., Marouf, 2007; Wei & Chen, 2006). Particularly, individuals who have close friendships with their coworkers create a potential subgroup that is more likely to yield interemployee helping through mutual expressive interaction, indicating that expressiveness interdependence positively affects their interemployee helping. From this, the hypotheses below are posited.

> *Hypothesis 7:* Expressiveness interdependence is positively related to knowledge sharing.
> *Hypothesis 8:* Expressiveness interdependence is positively related to interemployee helping.

Method

Subjects and Procedures

The subjects investigated in this study are made up of online knowledge workers in groups or teams across organizations within Taiwan's high-tech industry. The online knowledge workers were appropriately recruited, because the online working mode applied by today's knowledge workers to create and implement their new ideas has become a very popular style of work in developed countries. Fifty large and major IT firms in a well-known industrial zone in the northern part of Taiwan were initially chosen, and 19 out of the 50 firms agreed to offer assistance for our investigation. The 19 firms are appropriate representative samples, because they confirm their staffs heavily use online tools such as email, Usenet news, discussion boards, listservs, and management information systems systems during their work with one another.

Of the 569 questionnaires distributed to the subjects, 437 usable questionnaires were returned for a response rate of 76.80% (Lin, Chiu, Joe, & Tsai, 2009), containing 232 males (53.09%) and 205 females (46.91%). A satisfactory response rate of our survey is mainly because of the strong support of our sample firms in which their personnel departments first helped distribute the questionnaires to employees expressing their voluntariness and then traced the status of returned questionnaires. Furthermore, an independent *t* test in this study for detecting nonresponse bias suggested by Baruch and Holtom (2008) did not reveal any statistically significant difference between early and late respondents. While the sample contained 401 employees with a bachelor's degree or above (91.75%), it also revealed that 381 employees (87.19%) have job experience applying the Internet for a year or more. These above characteristics show that the sample firms were appropriate representatives for the population of online knowledge workers in IT industries. Appendix D lists the correlation matrix for our constructs based on the actual survey data.

Several steps were employed to develop scale items. To begin with, the items similar to what this study needed were first translated from existing literature into Chinese. Second, the items in Chinese were reworded, newly developed, or eliminated (e.g., those less relevant to this study) by a focus group of three graduate students and two professors who are familiar with organizational behavior and human resource management. Third, the measurements were further examined via two pilot tests before the actual survey. The pilot test data were subjected to exploratory factor analysis (EFA) and reliability analysis to identify items that loaded poorly on their hypothesized scales, which were then further refined, leading to considerable improvement in content validity and scale reliability. Finally, the focal points suggested by

Reynolds, Diamantopoulos, and Schlegelmilch (1993) were used for comparing our Chinese version questionnaire to the English one. A high degree of correspondence between the two questionnaires assures that the translation process did not notably bring in artificial translation biases. Appendix B lists all the items using 5-point Likert-type scales (5 = *strongly agree*, 1 = *strongly disagree*). Collectively, these scale items were modified from previous literature by being embedded with the features related to online virtual teams. Taking our items for measuring task effectiveness for example, our item ". . . reduces redundancy of work content" was modified from the item ". . . reduce redundancy of information and knowledge" by Gold et al. (2001). In another example, our item ". . . coordinates the efforts of everyone on the team" was modified from the item ". . . coordinate the development efforts of different units."

For better clarification, Appendix A provides the factor matrix from the second pilot test. Data from the second pilot were analyzed by EFA, using the principal components technique with varimax rotation. Six factors emerged from the analysis with eigenvalues greater than 1.0, corresponding to a hypothesized factor structure in Appendix A. Reliability analysis shows that each of our six constructs has a Cronbach's alpha of .76 or higher, fairly better than the acceptance norm of .70. Therefore, all scale items were retained for the remainder of the study. Note that scale validation was repeated for our actual sample data via the confirmatory factor analysis technique, as discussed next.

Data Analysis and Test Results

This study performs the analysis with a two-step structural equation modeling (SEM) approach (Anderson & Gerbing, 1988) with the CALIS procedure of SAS software, including measurement model and structural model testing. The maximum likelihood estimation (i.e., the default) used by this study is more theoretically and practically useful, because other estimations (e.g., generalized least-squares parameter estimate) strictly require a nonsingular correlation matrix or unreasonably assume multivariate normality of all variables and independence of observations (Hatcher, 1994). The test results from each stage of the analysis are shown as below.

Measurement Model Testing

In confirmatory factor analysis (CFA), the overall goodness-of-fit indices listed in Table 1 suggest that most fits of the measurement model are satisfactory—that is, the normalized chi-square (chi-square/degrees of freedom) of the CFA

Table 1. Standardized Loadings and Reliabilities

Construct	Indicators	Standardized Loading	AVE	Cronbach's α
Task effectiveness	TE1	0.74 (t = 17.25)	0.59	.88
	TE2	0.82 (t = 20.07)		
	TE3	0.81 (t = 19.84)		
	TE4	0.70 (t = 16.21)		
	TE5	0.78 (t = 18.73)		
Knowledge sharing	KS1	0.80 (t = 19.04)	0.65	.85
	KS2	0.79 (t = 18.68)		
	KS3	0.83 (t = 20.16)		
Interemployee helping	IH1	0.81 (t = 19.53)	0.70	.87
	IH2	0.81 (t = 19.44)		
	IH3	0.88 (t = 22.10)		
Outcome interdependence	OI1	0.77 (t = 18.22)	0.64	.88
	OI2	0.80 (t = 19.26)		
	OI3	0.83 (t = 20.53)		
	OI4	0.81 (t = 19.52)		
Task interdependence[a]	TI1	0.88 (t = 22.11)	0.70	.87
	TI2	0.89 (t = 22.31)		
	TI3	0.74 (t = 17.18)		
Expressiveness interdependence	EI1	0.62 (t = 13.21)	0.58	.79
	EI2	0.78 (t = 17.49)		
	EI3	0.86 (t = 19.98)		

Note. AVE = average variance extracted. Goodness-of-fit indices (N = 437): χ^2_{174} = 407.08 (p < .001); nonnormrmed fit index (NNFI) = .95; normed fit index (NFI) = .93; comparative fit index (CFI) = .96; goodness-of-fit index (GFI) = .92; adjusted goodness-of-fit index (AGFI) = .89; root mean square residual (RMR) = .03; root mean square error of approximation (RMSEA) = .06.
a. An indicator was excluded from this measurement model because of its insignificance.

model was smaller than the recommended value of 3.0. The comparative fit index (CFI), the goodness-of-fit index (GFI), the nonnormed fit index (NNFI), and the normed fit index (NFI) all exceeded the recommended value of .9, despite the adjusted goodness-of-fit index (AGFI) being slightly lower than .9. Furthermore, the root mean square error of approximation (RMSEA) was smaller than the recommended value of .08 (Bentler & Bonett, 1980), and the root mean square residual (RMR) was smaller than the recommended value of .05. These values strongly support that the

hypothesized model of this study in CFA fits well with the empirical data. The above goodness-of-fit indices used by this study have been strongly recommended by previous literature (Anderson & Gerbing, 1988; Bentler & Bonett, 1980; Hatcher, 1994). Note that the justification for choosing these indices herein is important. As an alternative to the chi-square test, Bentler and Bonett's (1980) NFI is considered the percentage of observed-measure covariation explained by a given measurement or structural model (Anderson & Gerbing, 1988; Hatcher, 1994). A variation on the NFI is the NNFI, which has been shown to better reflect model fit at all sample sizes (Bentler, 1989; Hatcher, 1994). In addition, Bentler's (1989) CFI is similar to the NNFI in which it offers an accurate assessment of fit regardless of sample size (Hatcher, 1994).

Convergent validity in Table 2 was achieved by meeting the three conditions below (Fornell & Larcker, 1981). To begin with, all factor loadings in CFA were significant at $p < .001$. The average variance extracted (AVE) for all research constructs exceeded 0.50, suggesting that the scale items capture sufficient variance in the underlying construct than that attributable to the measurement error. Finally, the reliabilities for each construct exceeded .70, satisfying the requirement of reliability for research instruments. To sum up, this study's empirical data meet all three conditions above to assure convergent validity.

Discriminant validity was evaluated in this study by chi-square difference tests based on the Bonferroni method, given that such a method is good in simultaneous pairwise comparisons for the constructs. Controlling for the experiment-wise error rate by setting the overall significance level to .001, the Bonferroni method indicated that the critical value of the chi-square difference should be 15.14. Chi-square difference statistics for all pairs of constructs exceeded this critical value of 15.14 (see Table 2), thereby supporting discriminant validity in this study's data.

Structural Model Testing

The CFA model was transformed to a structural model for the purpose of testing this study's hypotheses, and Table 3 lists the test results. Seven out of the eight hypotheses herein were validated at the $p < .001$ significance level. Task effectiveness is significantly influenced by both knowledge sharing and interemployee helping with standardized path coefficients of 0.43 and 0.35 (Hypotheses 1 and 2 are supported), respectively. Knowledge sharing and interemployee helping are affected significantly by outcome interdependence with respective coefficients of 0.39 and 0.48 (Hypotheses

Table 2. Chi-Square Difference Tests for Examining Discriminant Validity

Construct Pair	$\chi^2_{174} = 407.08$ (Unconstrained Model)	
	χ^2_{175} (Constrained Model)	χ^2 Difference
(Task effectiveness, Knowledge sharing)	748.04	204.99***
(Task effectiveness, Interemployee helping)	838.27	321.21***
(Task effectiveness, Outcome interdependence)	916.24	328.93***
(Task effectiveness, Task interdependence)	858.05	186.33***
(Task effectiveness, Expressiveness interdependence)	686.00	196.00***
(Knowledge sharing, Interemployee helping)	712.91	206.79***
(Knowledge sharing, Outcome interdependence)	706.16	226.63***
(Knowledge sharing, Task interdependence)	827.69	753.86***
(Knowledge sharing, Expressiveness interdependence)	589.19	933.80***
(Interemployee helping, Outcome interdependence)	826.12	534.58***
(Interemployee helping, Task interdependence)	946.69	239.73***
(Interemployee helping, Expressiveness interdependence)	748.04	332.25***
(Outcome interdependence, Task interdependence)	894.12	470.14***
(Outcome interdependence, Expressiveness interdependence)	693.13	559.03***
(Task interdependence, Expressiveness interdependence)	736.02	487.78***

***$p < .001$, by using the Bonferroni method.

3 and 4 are supported), whereas they are both also affected significantly by task interdependence with respective coefficients of 0.16 and 0.18 (Hypotheses 5 and 6 are supported). Finally, whereas knowledge sharing is significantly influenced by expressiveness interdependence with the coefficient of 0.42 (Hypothesis 7 is supported), interemployee helping is affected insignificantly by expressiveness interdependence (Hypothesis 8 is not supported).

The insignificant relationship between expressiveness interdependence and interemployee helping is surprising and may occur, perhaps because the help-ing actions in online working or collaboration are more instrumentally oriented and thus are likely influenced strongly by instrumental interdependence (e.g., task and outcome interdependence) rather than expressive interdependence

Table 3. Path Coefficients and *t* Value

Hypothesis	Standardized Coefficient	*t* Value
H1: Knowledge sharing → Task effectiveness	0.43***	7.31
H2: Interemployee helping → Task effectiveness	0.35***	6.26
H3: Outcome interdependence → Knowledge sharing	0.39***	7.02
H4: Outcome interdependence → Interemployee helping	0.48***	7.61
H5: Task interdependence → Knowledge sharing	0.16***	3.27
H6: Task interdependence → Interemployee helping	0.18***	3.27
H7: Expressiveness interdependence → Knowledge sharing	0.42***	7.28
H8: Expressiveness interdependence → Interemployee helping	0.06	1.16

***$p < .001$.

(i.e., expressiveness interdependence). Nevertheless, the unexpected results for the unsupported hypothesis may warrant further study so that the authentic cause behind the unsupported hypothesis may not be misinterpreted.

Discussion

Given that Taiwan's IT industry plays a key role in the global economy, our survey on it offers an important contribution for IT firms to learn the task effectiveness of online knowledge workers, its mediators and antecedents. Specifically, Taiwan's IT firms account for approximately half of the world's liquid-crystal displays (LCDs), three quarters of the world's production of PCs, a quarter of the world's semiconductors, and a fifth of the world's mobile phones (Reuters, 2009). Nevertheless, no previous research has attempted to examine task effectiveness from an aspect of interemployee linkages in Taiwan, as is done herein.

This study was one of the first to jointly examine the mediating influence of knowledge sharing and interemployee helping on task effectiveness in a single holistic model. Although employees are social beings in groups, they individually possess their own personalities or preferences for doing or not doing something (e.g., sharing or not sharing), and thus the sharing and helping may be less likely strengthened in the absence of social interdependence. The finding regarding the two mediators implies that management should find a balance for both tangible and intangible online activities. Overemphasizing either real assistance (e.g., providing an orientation for new online members) or virtual support (e.g., providing an online solution for solving a

technical difficulty) is unlikely to make today's organizations maximize their effectiveness. This kind of golden mean between sharing and helping is likely overlooked accidentally when managers are overwhelmingly distracted by the drumbeating of knowledge sharing in today's industries. To make knowledge easily expressed in language or symbols, or in a form which can be understood and shared among employees, management should apply appropriate techniques that help transform employees' ideas or images into words, concepts, figurative language (such as metaphors, analogies, or narratives), and visuals (Nonaka & Konno, 1998).

This study provides important evidence for how the mediating mechanisms of sharing and helping can be empirically applied to study the relationship between task effectiveness and social interdependence. According to this study's test results, knowledge sharing and interemployee helping are key mediators for task effectiveness among online knowledge workers, suggesting the importance of interpersonal interactions, both tangibly and intangibly. Indeed, although many business organizations today that count heavily on IT to execute online work are likely to emphasize and promote knowledge sharing because of the ease of IT application for such sharing, they have somewhat gradually ignored the importance of interemployee helping which should be done via real face-to-face contacts among online knowledge workers (even if such helping is not directly related to online work).

Our empirical analysis demonstrates that when social interdependence (i.e., outcome, task, and expressiveness) is taken into account, the influence of expressiveness interdependence on interemployee helping among online knowledge workers does not exist, though the same cannot be said for outcome interdependence and task interdependence. These various influences from different kinds of interdependence point to a complex and intricate pattern of relationships between social predictors of interemployee helping, which may be the subject of more detailed investigations in the future. Three-way social interdependence, which seems very plausible from logical and empirical perspectives, is not reflected in any contemporary models of knowledge sharing or interemployee helping, offering a unique opportunity for theory building in this area. Empirical evidence of the three-way effects from the three respective dimensions of social interdependence, as observed in this study, is all the more reason why we should not only count on one of the three dimensions in isolation, but also in conjunction within a larger holistic model of knowledge sharing and interemployee helping.

The outcome and task interdependence are both significantly influential to knowledge sharing and interemployee helping, suggesting that the interdependent systems (e.g., bonuses, mission assigning, etc.) for task and outcome

should be designed simultaneously with similar weights. More important, a concept that accentuates both the results and processes of online working or collaboration should be kept in the mind of managers, because the prevalence of utilitarianism in profit organizations often misleads managers to care about the results more highly than the processes. Organizations stressing only on outcome interdependence entirely (rather than task interdependence) imply encouragement to the members to obtain their common goals by fair means or foul, consequently hurting the organizations. It is preferable for online members who are consulted before managers structure the interdependence systems related to organizational tasks and outcomes.

The finding of this study regarding the significant effect of expressiveness interdependence on knowledge sharing rather than interemployee helping is a unique and important one, because it helps avoid the potential intuitive fallacy of management in practice whereby both sharing and helping could be influenced by the same factors. It is necessary for management to know that financial incentives related to outcome interdependence are no longer sufficient for boosting knowledge sharing, but instead managers have to learn how to catalyze knowledge sharing via expressiveness interdependence such as mutual support in terms of, for example, feeling, empathy, and sentiment. Because workers' expressiveness interdependence cannot be established in a short period of time simply by managers making company policies and regulations, nonofficial activities among workers that help improve organizational sentiment and affections should be provided on a regular basis by management, including, for instance, camping, sports games, pot luck parties, and so on.

In summary, the findings of this study lend support to the literature that strives to explain how a lack of knowledge sharing and interemployee helping in workplaces can lead to detrimental results for task effectiveness. No single management practice can overpower another practice in uplifting employees' helping and sharing without constant observations on online working, collaboration, or actions. Management should create optimistic organizationally interdependent systems and periodically adjust them with effective policies or measures, as suggested above, to inspire sharing and helping spirits which can reinforce task effectiveness in the long run.

Limitations

The results of this study should be interpreted in light of their limitations. The first limitation is the possibility of common method bias given that the constructs of this study were measured with Likert-type scales. To confirm a potential threat by this bias, a Harmon's single-factor test (Podsakoff & Organ, 1986) was performed herein. An exploratory factor analysis of all

items for the six constructs in Table 2 revealed six factors explaining 21.76%, 19.17%, 15.68%, 15.57%, 14.36%, and 13.46% of the total variance, respectively. These values show that none of the factors can solely account for the majority of the covariance in the independent and dependent variables, suggesting that the variances are properly distributed among the proposed factors. Hence, common method bias is unlikely a threat in our data sample. We conduct a further analysis of competing models suggested by Avolio, Sivasubramaniam, Murray, Jung, and Garger (2003) so as to ensure that our research model is tentatively accepted based on our survey. The fit indices of the validation models in Appendix C show that our research model based on the six factors is the best among competing models.

The second limitation relates to the cross-sectional investigation used by this study. The cross-sectional nature of the investigation limits our ability to obtain causal inferences from the data. As such, longitudinal studies may be important in this area of research. The third limitation is the way this study operationalizes social interdependence into three dimensions: outcome, task, and expressiveness interdependence. There may be other social interdependence mechanisms (e.g., D. W. Johnson, 2003) that warrant future investigation.

The third limitation relates to a lack of a control of corporate culture that may affect some constructs of this study (e.g., Elfenbein & O'Reilly, 2007; Zaidman & Brock, 2009). For example, previous research suggests that corporate culture could affect knowledge sharing (McDermott & O'Dell, 2001), interemployee helping (Appelbaum et al., 2004), and job effectiveness (Fey & Denison, 2003). Future research may focus on the issue of corporate culture based on this study so as to generate insights about how corporate culture truly influences various research constructs.

Because of its focus on interpersonal interactions (e.g., interpersonal sharing and helping), this study intends to keep the analysis at the individual level, and thus the factors at higher levels based on teams or firms are not examined, suggesting an important direction for future research to evaluate knowledge sharing based on the levels of groups or organizations for comparisons with this study. By focusing on various levels of analysis (e.g., industry level or alliance level), future researchers can generate theories that provide a better understanding and prediction of management phenomena (Dansereau, Yammarino, & Kohles, 1999), complementing our research findings.

With regard to future research, although this study can be replicated for studying organizational issues in Asian cultural settings with or without any slight amendment, its reproduction in other cultural settings (e.g., American or European cultures) should be done with great caution because of significant differences across different regional cultures (Kasper & Mühlbacher, 2008).

Because this research focuses on the mediating mechanism of sharing and helping, this research has limited the consideration of behavioral predictors to social interdependence suggested by the mechanism. However, future researchers are advised to cover additional predictors beyond social interdependence and compare their explanatory ability to that examined in this study. For example, prosocial values (e.g., Grant, Parker, & Collins, 2009), social attachment (Wiltermuth & Heath, 2009), social identity, social capital, social networks, or nonofficial mentoring activities (e.g., Ortiz-Walters, 2009) are potential factors for future researchers to assess task effectiveness based on our findings.

Given that expressiveness interdependence has a lot to do with employees' exchange of their sentiment and emotions that ultimately affect their task performance, further development on the operationalization of emotion-related constructs such as negative emotion (Durand, Newby, & Sanghani, 2008), emotion-focused copying (Frese, Fay, Hilburger, Leng, & Tag, 1997), and so on in future research may be necessary.

Appendix A

Factor Matrix From Second Pilot Test[a]

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
TE1	**0.841**	0.120	0.235	0.133	0.145	0.099
TE2	**0.891**	0.170	0.048	0.109	0.150	0.083
TE3	**0.820**	0.019	0.184	0.143	0.305	0.180
TE4	**0.647**	−0.006	0.318	0.093	0.207	0.309
TE5	**0.788**	0.105	0.250	0.213	−0.091	0.085
KS1	0.285	0.178	0.123	0.360	0.027	**0.745**
KS2	0.300	0.227	0.076	0.278	0.368	**0.617**
KS3	0.113	0.224	0.232	0.136	0.349	**0.710**
IH1	0.211	0.269	0.229	0.342	**0.709**	−0.031
IH2	0.094	0.325	0.048	0.191	**0.707**	0.238
IH3	0.232	0.108	0.218	−0.064	**0.719**	0.400
OI1	0.146	**0.805**	0.066	−0.068	0.125	0.207
OI2	0.012	**0.826**	0.193	0.215	0.227	0.150
OI3	0.125	**0.876**	0.145	0.047	0.127	−0.057
OI4	0.074	**0.758**	0.182	0.239	0.134	0.263
TI1	0.171	0.142	**0.821**	0.196	0.287	−0.049
TI2	0.278	0.127	**0.697**	−0.056	0.431	0.134
TI3	0.304	0.227	**0.775**	−0.007	−0.018	0.230
TI4	0.401	0.301	**0.593**	0.150	−0.082	0.296

Appendix A (continued)

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
EI1	0.142	0.191	0.052	**0.833**	0.061	0.068
EI2	0.238	−0.078	0.125	**0.818**	0.081	0.188
EI3	0.127	0.245	−0.021	**0.674**	0.259	0.349
Cronbach's α	.91	.89	.85	.76	.81	.84

Note. TE = task effectiveness; KS = knowledge sharing; IH = interemployee helping; OI = outcome interdependence; TI = task interdependence, EI = expressiveness interdependence.
a. Based on principal components technique with varimax rotation (sample size = 65).

Appendix B

Measurement Items (5-Point Likert-Type Scales)

Task effectiveness (Source: Gold et al., 2001)
- TE1. The online collaboration of our team reduces redundancy of work content.
- TE2. The online collaboration of our team improves team efficiency.
- TE3. The online collaboration of our team coordinates the efforts of everyone on the team.
- TE4. The online collaboration of our team facilitates innovating new ideas.
- TE5. The online collaboration of our team streamlines the internal processes.

Knowledge sharing (Source: Lin, 2007a)
- KS1. I share my job experience with my online coworkers.
- KS2. I share my expertise at the request of my online coworkers.
- KS3. I share my ideas about jobs with my online coworkers.

Interemployee helping (Source: Lin, 2006)
- IH1. I help coworkers who have been absent from work.
- IH2. I willingly help others who have work-related problems.
- IH3. I help orient new employees even though it is not required.

Outcome interdependence (Source: Van Der Vegt, Emans, & Van De Vliert, 1998)
- OI1. It benefits me when my online coworkers attain their goals.
- OI2. The things my online coworkers want to accomplish and the things I want to accomplish are compatible.
- OI3. It is advantageous for me when my online coworkers succeed in their jobs.

(continued)

Appendix B (continued)

    OI4. When my online coworkers succeed in their jobs, it works out positively for me.

  Task interdependence (Source: Van Der Vegt, Emans, & Van De Vliert, 1998)

    TI1. My online coworkers depend on me for online information (or online advice).

    TI2. My online coworkers depend on my online support (or online help).

    TI3. I depend on my online coworkers for providing online files (or online messages) I need.

    TI4. I depend on my online coworkers for doing my work well.

  Expressiveness interdependence (Source: Lin, 2007a)

    EI1. I am well acquainted personally with my online coworkers.

    EI2. I talk about things beyond work with my online coworkers.

    EI3. My online coworkers and I exchange views related to personal matters.

Appendix C

Fit Indices of This Study's Validation Models

Models	χ^2	df	χ^2/df	NNFI	NFI	CFI	GFI	AGFI	RMR	RMSEA
Model 1[a]	2217.80	189	11.73	.58	.60	.62	.63	.55	.05	.16
Model 2[b]	1821.07	188	9.69	.66	.67	.69	.68	.61	.05	.14
Model 3[c]	1634.50	186	8.79	.69	.70	.73	.71	.64	.05	.13
Model 4[d]	1235.12	183	6.75	.77	.78	.80	.76	.70	.05	.12
Model 5[e]	845.19	179	4.72	.84	.85	.85	.82	.77	.05	.09
Model 6[f]	407.08	174	2.34	.95	.93	.96	.92	.89	.03	.06

Note. NNFI = nonnormrmed fit index; NFI = normed fit index; CFI = comparative fit index; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; RMR = root mean square residual; RMSEA = root mean square error of approximation.
a. Model 1 = One factor (all six constructs in this study are grouped as one factor for confirmatory factor analysis).
b. Model 2 = Two factors (except task effectiveness, the other five factors in this study are grouped as a factor).
c. Model 3 = Three factors (interemployee helping, outcome interdependence, task interdependence, and expressiveness interdependence are grouped as a factor).
d. Model 4 = Four factors (outcome interdependence, task interdependence, and expressiveness interdependence are grouped as a factor).
e. Model 5 = Five factors (task interdependence and expressiveness interdependence are grouped as a factor).
f. Model 6 = All six factors.

Appendix D
Correlation Matrix

Name	TE1	TE2	TE3	TE4	TE5	KS1	KS2	KS3	IH1	IH2	IH3	OI1	OI2	OI3	OI4	TI1	TI2	TI3	ET1	ET2	ET3
Mean	3.597	3.680	3.677	3.545	3.670	3.764	3.899	3.735	3.888	3.952	3.922	3.801	3.776	3.753	3.844	3.330	3.295	3.437	3.462	3.579	3.648
Std	0.774	0.747	0.744	0.785	0.761	0.693	0.597	0.725	0.601	0.567	0.645	0.666	0.671	0.699	0.634	0.761	0.785	0.777	0.755	0.816	0.751
TE1	1.000	0.697	0.558	0.464	0.584	0.307	0.309	0.324	0.351	0.275	0.351	0.276	0.316	0.311	0.269	0.323	0.332	0.331	0.339	0.141	0.193
TE2		1.000	0.655	0.533	0.641	0.352	0.349	0.342	0.354	0.316	0.353	0.355	0.388	0.410	0.369	0.344	0.349	0.376	0.353	0.170	0.236
TE3			1.000	0.612	0.626	0.419	0.407	0.393	0.468	0.371	0.445	0.365	0.415	0.397	0.423	0.354	0.422	0.383	0.417	0.301	0.354
TE4				1.000	0.562	0.381	0.323	0.428	0.349	0.317	0.351	0.388	0.350	0.342	0.337	0.417	0.409	0.368	0.372	0.277	0.311
TE5					1.000	0.367	0.341	0.390	0.385	0.314	0.378	0.372	0.381	0.355	0.345	0.366	0.363	0.395	0.381	0.219	0.254
KS1						1.000	0.611	0.672	0.405	0.281	0.372	0.367	0.377	0.364	0.415	0.305	0.310	0.288	0.458	0.422	0.503
KS2							1.000	0.664	0.454	0.460	0.486	0.428	0.413	0.407	0.413	0.280	0.332	0.307	0.363	0.313	0.391
KS3								1.000	0.426	0.343	0.446	0.465	0.415	0.404	0.424	0.333	0.376	0.332	0.409	0.326	0.418
IH1									1.000	0.658	0.699	0.339	0.381	0.365	0.399	0.236	0.328	0.256	0.266	0.179	0.238
IH2										1.000	0.718	0.357	0.364	0.346	0.317	0.281	0.269	0.320	0.218	0.080	0.187
IH3											1.000	0.455	0.458	0.400	0.385	0.305	0.358	0.412	0.277	0.177	0.232
OI1												1.000	0.624	0.642	0.594	0.333	0.349	0.395	0.334	0.195	0.267
OI2													1.000	0.654	0.635	0.379	0.383	0.368	0.377	0.238	0.317
OI3														1.000	0.704	0.326	0.304	0.361	0.377	0.167	0.284
OI4															1.000	0.282			0.347	0.236	0.333
TI1																1.000	0.789	0.644	0.353	0.224	0.236
TI2																	1.000	0.637	0.261	0.191	0.212
TI3																		1.000		0.153	0.249
ET1																			1.000	0.462	0.502
ET2																				1.000	0.693
ET3																					1.000

Note. TE = task effectiveness; KS = knowledge sharing; IH = interemployee helping; OI = outcome interdependence; TI = task interdependence; EI = expressiveness interdependence.

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Bio

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