Using IT to share knowledge and the TRA

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Abstract

Purpose – *The major objective of this paper is to examine whether or not information technology (IT) usage to share knowledge is a mediator or moderator of the intention behaviour relationship proposed in the theory of reasoned action (TRA).*

Design/methodology/approach – *A letter of invitation to participate in the study was sent to all of the public-listed companies in Malaysia. A total of 483 full-time employees from 23 organizations completed an anonymous, self-administered survey in a cross-sectional design. Partial least squares analysis was used to test the conceptual model.*

Findings – *The major finding is that the relationship between the intention to share knowledge and knowledge sharing is partly mediated and not moderated by IT usage to share knowledge.*

Research limitations/implications – *Knowledge sharing was considered only at the individual level. The data are self-reported, cross-sectional, from a single source and a single method. The relational and capability-membership perspective leads to a positive attitude towards knowledge sharing whereas the instrumental perspective leads to a negative attitude. The findings augment the TRA by showing there is a mediator of the intention-behaviour relationship in the context of knowledge sharing.*

Practical implications – *The findings indicate that organizations need to ascertain employees' preferred methods for sharing knowledge, provide appropriate IT for knowledge sharing, establish online communities for knowledge sharing, publicly acknowledge members for sharing knowledge, and avoid relying on extrinsic tangible rewards to foster knowledge sharing.*

Originality/value – *Previous research has shown that using IT to share knowledge does not moderate the intention-behaviour relationship in the TRA. An alternative conceptualisation of the role of using IT to share knowledge in the intention-behaviour relationship is provided.*

Keywords *Theory of reasoned action, Knowledge sharing, Information technology, Expected association, Expected contribution, Expected rewards*

Paper type *Research paper*

Knowledge is a precious resource for any organization and the effective use of knowledge can provide organizations with sustainable competitive advantages (Fernie *et al.*, 2003). Knowledge sharing amongst employees needs to be encouraged (Motwani *et al.*, 2005) because it is a prerequisite for success (Hansen *et al.*, 1999). Peer mentoring can increase knowledge sharing (Bryant, 2005) whilst downward knowledge sharing increases perceptions of procedural justice and extra-role behaviors (Paré and Tremblay, 2007), and ultimately organizational performance.

The theory of reasoned action (TRA) has received extensive attention from scholars over the last few decades and has been used to examine the relationships between attitudes, intentions, and various types of behaviors. The TRA has been used in social psychology (Fukukawa, 2002), marketing (Shim *et al.*, 2001), decision-making (Edwin *et al.*, 2006), and the adoption of information systems (Liao *et al.*, 1999).

According to the TRA, the attitude towards a behavior and the subjective norm towards the behavior influence the intention to perform the behavior and eventually the enactment of the behavior (Ajzen and Fishbein, 1975, 1980). In other words, the TRA posits a causal chain wherein both personal and collective attitudes towards a behavior determine the intention to perform the behavior, and consequently the performance of the behavior.

There is evidence (Mathur, 1998; Lippke *et al.*, 2009) of mediators and moderators of the intention-behavior relationship. The TRA has also been applied to knowledge sharing and the use of information technology (IT) to share knowledge has been found not to moderate the relationship between intention and knowledge sharing (Bock and Kim, 2002). The contribution of this paper to the literature on knowledge sharing is the re-examination of the role of IT usage to share knowledge in the intention-behavior relationship. Figure 1 depicts the hypothesized model.

The theoretical underpinnings of the hypothesized model are discussed in the next section. The research methodology is described in the third section. The fourth section contains a discussion of the data analysis procedures and the findings. The implications of the findings for both theory and research are discussed in the fifth section. In the final section, the limitations of the study and areas for future research are considered.

Theoretical background

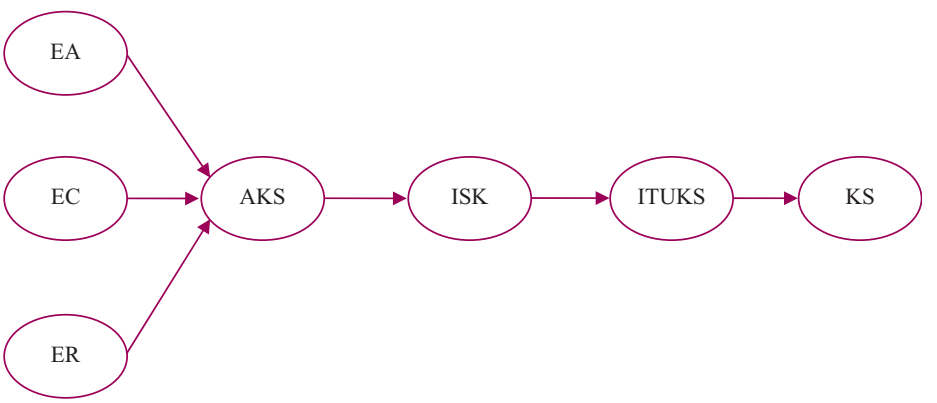
An attitude is essentially a judgment. Judgments can be made about anything including a person, a place, a physical item, an event, a belief, or even another attitude (Coon, 2004). The attitude towards sharing one's knowledge with other members of the organization is affected by numerous factors. Among these factors are expectations such as the expectation that one will be rewarded for sharing knowledge, the expectation that sharing one's knowledge will improve relationships with other members of the organization, and the expectation that sharing one's knowledge will help the organization (Bock and Kim, 2002).

Expected rewards and attitude toward knowledge sharing

Expected rewards refers to the expectation that one will receive tangible extrinsic rewards for sharing knowledge. It is argued here that expected rewards stems from an instrumental perspective of knowledge sharing and this perspective can have a positive influence on attitudes toward knowledge sharing.

Employees can develop an instrumental (i.e. calculative, cost-benefit) perspective of knowledge sharing. An explanation of how such a perspective can develop is provided next

Figure 1 The hypothesized model



Notes: EA = Expected Association; EC = Expected Contribution; ER = Expected Rewards; AKS = Attitude to Knowledge Sharing; ISK = Intention to Share Knowledge; ITUKS = IT Usage for Knowledge Sharing; and KS = Knowledge Sharing

based on economic exchange theory (Homans, 1961), expectancy theory (Vroom, 1964), equity theory (Adams, 1963), and Thorndike's stimulus-response theory.

An economic exchange is a specific transaction between two parties that does not render either party obligated to the other after the transaction has occurred (Homans, 1961). People are motivated to perform when they believe they can achieve a performance target if they put in the effort (i.e. effort-performance belief; expectancy), when they believe they will receive a particular outcome if they achieve the target (i.e. performance-outcome belief; instrumentality), and when they have a strong preference or aversion for the outcome (i.e. valence) (Vroom, 1964).

People calculate input-output ratios, which is the ratio of what they have contributed to what they have received, and then compare their own ratio with those of referent others (Adams, 1963). When one's own ratio is perceived to be less favorable than that of referent others, a demotivating sense of inequity or injustice arises. In contrast, when one's ratio is perceived to be similar to those of referent others, a motivating sense of equity or justice arises (Stecher and Rosse, 2007).

According to Thorndike's law of effect, a behavior is more likely to be repeated if it is rewarded. Consistently rewarding a behavior can therefore create a favorable attitude to the behavior.

The sharing of one's knowledge becomes an economic exchange when one expects to receive specific extrinsic rewards for doing so (Bock and Kim, 2002). Rewards can cultivate a favorable attitude to knowledge sharing, and thus be motivating, if they are perceived as valuable (i.e. have a positive valence), attainable (i.e. expectancy), fair (i.e. equitable), and are provided consistently (i.e. law of effect).

People may not be willing to share knowledge unless they are rewarded for doing so (Hansen *et al.*, 1999; Stevens, 2000). The lack of an effective, equitable and adequate reward system for motivating people to share knowledge is a common barrier to knowledge sharing (Constant *et al.*, 1994; Huber, 2001; Riege, 2007; Szulanski, 1996). Extrinsic rewards can foster knowledge transfer (Cruz *et al.*, 2009).

When knowledge sharing becomes an economic exchange wherein the knowledge sharer considers the value, attainability, fairness, consistency, and benefits of the rewards for sharing knowledge, the instrumental perspective of knowledge sharing occurs. The decision to share knowledge based on the instrumental perspective is therefore a calculative one (Pardo *et al.*, 2007) because it depends on the sharer perceiving the reward as attainable, equitable, and self-benefiting (Voelpel and Han, 2005). The following hypothesis is therefore proposed:

H1. Expected rewards and attitude toward knowledge sharing are positively correlated.

Expected association and attitude toward knowledge sharing

Expected association refers to the expectation that sharing one's knowledge with other organizational members will strengthen one's social ties with other members and generally improve one's workplace relationships. It is argued here that expected association stems from a relational perspective of knowledge sharing and this perspective can have a positive influence on attitudes toward knowledge sharing.

Various theories and factors including need for affiliation (McClelland, 1985), relationship motivation (Randel and Ranft, 2007), social exchange theory (Blau, 1964), workplace social inclusion (Pearce and Randel, 2004), and social capital theory (Coleman, 1988) can be used to explain how a relational perspective of knowledge sharing develops.

People with a high need for affiliation need to have harmonious relationships and seek approval from others (McClelland, 1985). Relationship motivation is similar to but more specific than need for affiliation because it refers to the desire to maintain social ties that

enhance one's personal friendships and social support with colleagues (Randel and Ranft, 2007).

Social exchanges (e.g. doing someone a favor by sharing one's tacit knowledge) involve non-specific obligations (Blau, 1964) that stem from the norm of reciprocity (Gouldner, 1960). Workplace social inclusion stems from informal social ties with coworkers and refers to the feeling that one is socially included by colleagues (Pearce and Randel, 2004).

Social capital refers to the benefits that ensue because of close ties with members of one's connections (Coleman, 1988). Private goods social capital refers to ''assets'' such as networks that generate social capital for individuals and which are motivational because they directly benefit individuals (Leana and Van Buren, 1999).

Employees can develop a favorable attitude towards knowledge sharing for relational reasons. Employees who wish to develop personal friendships with and social support from colleagues (i.e. need for affiliation and relationship motivation) are likely to have a favorable attitude towards sharing knowledge with colleagues because knowledge sharing is one way of building close relationships with colleagues (Hsu and Lin, 2008).

Employees can develop close ties with colleagues by willingly doing favors for colleagues such as sharing knowledge that can help colleagues to solve work-related problems or improve task-efficiency. Knowledge that is shared as a favor improves relationships because of the positive affect that results from social exchanges that are direct and successful (Lawler, 2001). The close social ties that develop as a result of helping colleagues by sharing knowledge are likely to increase acceptance by and bonding with colleagues (i.e. workplace social inclusion).

An individual who wants to have close social ties with colleagues is likely to have a favorable attitude towards sharing knowledge with colleagues because knowledge sharing can increase private goods social capital by enhancing one's reputation and therefore one's standing amongst colleagues (Wasko and Faraj, 2005). The following hypothesis is therefore proposed:

H2. Expected association and attitude toward knowledge sharing are positively correlated.

Expected contribution and attitude toward knowledge sharing

Expected contribution refers to the expectation that sharing one's knowledge with other members of the organization will benefit the organization. It is argued here that expected contribution stems from a capability-membership perspective of knowledge sharing and has a favorable attitude to knowledge sharing. This perspective occurs when individuals not only believe they possess knowledge that can benefit the organization but also want to help the organization.

The capability aspect of the capability-membership perspective of knowledge sharing is discussed first. An explanation of the capability aspect based on both social-cognitive theory (Bandura, 1997) and role competence (Boyatzis, 1982), and the positive influence of the capability aspect on attitudes toward knowledge sharing is provided next.

General self-efficacy refers to the belief that one is capable of coping with a broad range of stressful or challenging situations. In contrast, domain-specific self-efficacy refers to the belief that one is capable of completing a particular task or achieving a particular goal (Bandura, 1997; Luszczynska *et al.*, 2005).

Role competence refers to the belief that one is knowledgeable, skilled, and experienced with regards to a specific role. Such a belief is likely to have developed from role-specific mastery experiences (Bandura, 1997; Grzeda, 2005) thereby increasing the motivation to perform the role. Role competence is therefore a type of domain-specific self-efficacy.

Role competence should lead to the belief that one possesses knowledge that is valuable to the organization and that sharing such knowledge with organizational members will benefit the organization (i.e. expected contribution): for example, enhance the organization's

performance and reputation (i.e. public goods social capital) (Martínez-Cañas and Ruiz-Palomino, 2010). Role competence should therefore have a positive effect on positive attitudes toward knowledge sharing because individuals are more likely to have positive attitudes toward knowledge sharing when they believe that their knowledge is useful (Hall, 2001) and that their knowledge can benefit the organization (Ba *et al.*, 2001; Bock and Kim, 2002).

The membership aspect of the capability-membership perspective of knowledge sharing is discussed next. An explanation of how this aspect can have a positive influence on attitudes toward knowledge sharing is provided based on affective commitment to the organization (Allen and Meyer, 1990), social-identity theory (Tajfel and Turner, 1979), and social capital theory (Coleman, 1988).

Affective commitment to the organization refers to feeling a sense of belongingness and emotional attachment to the organization (Allen and Meyer, 1990). Social-identity theory proposes that one's identity or self-concept is strongly influenced by the groups to which one belongs (Tajfel and Turner, 1979). Public goods social capital refers to the social capital of a social unit rather than of an individual. With this type of social capital, the actions of individuals directly benefit the organization and the individual benefits subsequently because of the organization's increase in social capital (Leana and Van Buren, 1999).

Employees who have close relationships with their colleagues and who feel valued and cared for by the organization are likely to feel a sense of belongingness and attachment to the organization (i.e. affective commitment), and consequently they are likely to incorporate organizational membership into their identities (i.e. social-identity). Such employees are likely to have a positive attitude towards knowledge sharing because they benefit from the organization's social capital. The following hypothesis is therefore proposed:

H3. Expected contribution and attitude toward knowledge sharing are positively correlated.

Attitude to knowledge sharing, intention to share knowledge, and the use of IT to share knowledge

Gao and Kwok's (2005) review found that attitude toward knowledge sharing has a major influence on intention to share knowledge. There is considerable evidence that attitude toward knowledge sharing is directly and positively related to intention to share knowledge (Bock *et al.*, 2005; Chatzoglou and Vraimaki, 2009; Ding and Ng, 2009).

Employees who intend to share knowledge with their colleagues are likely to use all available means to share their knowledge. Knowledge can be shared via several means such as meetings, manuals, telephone conversations, seminars, conferences, and on-the-job training. The intention to share knowledge should thus drive not only the use of IT to share knowledge but also the use of other means that may, in some instances, be more efficient than IT.

IT is a major enabler of knowledge management and a powerful means for sharing knowledge (Mitchell, 2003). IT such as intranets, databases, e-mail, web pages, bulletin boards, and electronic forums provide effective knowledge-sharing mediums (Song, 2001). Health community support groups rely heavily on IT to facilitate patient-to-patient knowledge transfer (Ghazali *et al.*, 2010). Different types of IT are used by health community groups for sharing different types of information:

- websites are used to disseminate documents, multimedia materials, newsletters, and links to external resources; and
- discussion forums are used to share information directly with other individuals (Ghazali *et al.*, 2010).

There are numerous barriers to knowledge sharing such as differences in education levels between the knowledge owner and recipient, absence of a learning organizational climate, incompatible IT systems and processes (Riege, 2005), and a lack of confidence in one's

expertise (Ardichvilli *et al.*, 2003). IT can facilitate knowledge sharing because it can remove some of the barriers to knowledge sharing but not others. Although IT can reduce the time and effort required to share certain types of knowledge it cannot reduce barriers such as competitiveness between business units, functional areas, and subsidiaries.

The time and effort required to share knowledge appear to be key barriers to knowledge sharing (Kankanhalli *et al.*, 2005; Lee *et al.*, 2006). Employees sometimes face social dilemmas such as when their personal interests are incongruent with those of their colleagues or the overall organization. These dilemmas occur, for example, when employees are struggling to meet their own deadlines and receive requests for assistance from colleagues regarding technical matters. In such situations, even though the knowledge owner is willing to help (i.e. intends to share knowledge), the time and effort required to meet face-to-face to assist the recipient become salient barriers to knowledge sharing; the barriers of time and effort can be overcome by using IT to provide the recipient with the requested information.

The intention to share knowledge might increase the use of IT to share knowledge. There is evidence (e.g. van den Hooff and de Ridder, 2004) to suggest that using IT such as computer-mediated communication to share knowledge has a positive effect on knowledge sharing possibly because of anonymity, lack of social cues, and absence of status differences (van den Hooff and de Ridder, 2004). The intention to share knowledge might also increase the use of IT to share knowledge because IT can reduce the time and effort that is required to share knowledge.

Based on the rationale provided above, there are good reasons to expect a positive relationship between attitude to knowledge sharing and intention to share knowledge, and a positive relationship between intention to share knowledge and using IT to share knowledge. Attitude to knowledge sharing may thus increase the use of IT to share knowledge because it increases the intention to share knowledge. The following hypothesis is therefore proposed:

H4. The relationship between attitude to knowledge sharing and IT usage to share knowledge is mediated by the intention to share knowledge.

Intention to share knowledge, the use of IT to share knowledge, and knowledge sharing

There is considerable evidence that intention to perform a behavior is correlated to the enactment of the behavior. Although intentions do not perfectly predict behavior, intentions can be the most accurate predictor of behavior (Ajzen and Fishbein, 1975), because behaviors are usually aligned with intentions (Ajzen and Fishbein, 1980).

Several studies (e.g. Bock *et al.*, 2005; Ryu *et al.*, 2003; Watchravesringkan and Shim, 2003) have reported a positive correlation between behavioral intentions and actual behaviors in the context of knowledge sharing. Basically, people are more likely to share knowledge if they have a strong intention to do so (Lin and Lee, 2004). Intention to share knowledge should thus be positively related to sharing knowledge.

The intention to enact a particular behavior does not always lead to the enactment of the behavior (i.e. the intention-behavior gap; Sheeran, 2002). The relationship between intention and behavior is likely to be mediated and/or moderated by variables that facilitate the intention manifesting into behavior. In other words, post-intentional variables can influence intention being translated into action (Sniehotta *et al.*, 2005).

Trying has been shown to mediate the intention-behavior relationship whilst actual control positively moderates the relationship between trying and behavior (Mathur, 1998). Action planning has also been shown to mediate the intention-behavior relationship such that intentions are more likely to result in behavior when individuals make an action plan whilst self-efficacy positively moderates the relationship between action planning and behavior (Lippke *et al.*, 2009). Making an action plan can be regarded as a form of trying.

The intention to perform a behavior should result in one exerting effort (i.e. trying) to fulfill the intention. As mentioned earlier, knowledge can be shared in various ways (e.g. meetings, conferences) one of which is to use IT. For example, updates on relevant documents can be

posted on bulletin boards or sent via e-mail to colleagues. The use of IT to share knowledge should therefore be positively and directly related to intention to share knowledge.

The use of IT to share knowledge is likely not only to be directly related to intention to share knowledge but also partially mediate the relationship between intention to share knowledge and knowledge sharing. Partial mediation seems more likely than full mediation because knowledge can be shared via means other than IT. Based on this rationale, it is argued that intention to share knowledge increases knowledge sharing partly because it increases the use of IT to share knowledge. The following hypothesis is therefore proposed:

H5. The relationship between intention to share knowledge and knowledge sharing is partially mediated by IT usage to share knowledge.

Method

Sample

A total of 1,190 questionnaires were distributed to full-time employees in 23 organizations in Malaysia. A total of 491 questionnaires were returned, yielding a response rate of 41.3 percent. According to Baruch and Holtom (2008), this response rate is acceptable. Eight of the returned questionnaires were incomplete and were therefore discarded. The final sample size is 483.

A total 16 of the organizations were listed on the main board in the Malaysian stock exchange, which is for firms with a minimum of RM60 million capital ($n = 313$); four were listed on the secondary board in the Malaysian stock exchange, which is for firms with a minimum of RM40 million capital ($n = 59$); two were from the Malaysian Exchange of Securities Dealing and Automated Quotation (MESDAQ), which is a separate securities market for listing technology-based firms ($n = 40$); and one was a non-listed accounting firm ($n = 71$). Of the 16 main board organizations, six were trading firms, four were industrial manufacturing firms, two were construction firms, two were properties firms, one was a finance firm, and one was a plantation firm. Of the four secondary board organizations, two of the firms were involved in consumer products and the other two in industrial products.

The final sample consists of 270 (i.e. 56 percent) males and 212 (i.e. 44 percent) females. The average age of the respondents was 33.2 years (SD = 8.6 years). The educational levels of the respondents are as follows: secondary school or below (26); certificate/diploma (135); bachelors degree (244); postgraduate degree (23); and other (21). A total of 33 of the respondents did not indicate their highest level of education. Respondents had, on average, been with their organizations for 6.5 years (SD = 6.6 years).

Approximately 60 percent of participants occupy non-managerial roles, 22 percent are managers, 10 percent are heads or deputy heads of their business units, 3 percent are directors, and the remainder occupy other designations. The work experience of participants ranges from 0.4 years to 42 years. The mean work experience is 4.9 years with a standard deviation of 5.5 years.

Measures

The authors are grateful to Professor Gee Woo Bock for providing us with the items as provided in the Appendix. Expected association was measured using five items, expected contribution was measured using five items, expected rewards was measured using three items, attitude to knowledge sharing was measured using four items, intention to share knowledge was measured using five items, level of IT usage was measured using three items, and knowledge sharing was measured using five items. It is noteworthy that the original items for level of IT usage refer to the use of IT to share knowledge rather than to the use of IT *per se*, and therefore the label from ''level of IT usage'' has been changed to ''IT usage to share knowledge''.

Procedure

Permission was obtained from publicly listed companies to distribute the questionnaire to their employees. Potential participants were informed that participation was voluntary and that their anonymity was guaranteed. The questionnaire was self-administered so that participants could complete it at their convenience. The completed questionnaires were returned to the researchers via self-addressed envelopes that the researchers provided.

The hypothesized model was tested using a partial least squares (PLS) analysis. PLS analysis was chosen because it does not make any assumptions about multivariate normality, it is appropriate when multicollinearity is present (several of the exogenous variables have moderate to strong correlations), and it is appropriate for testing complex models (Chin, 1998). The statistical significance of the path coefficients was examined via the bootstrapping procedure in PLS Graph. Bootstrapping involves the random re-sampling of the original dataset to create new samples of the same size as the original dataset. This method tests not only the reliability of the dataset but also provides a means for estimating the error of the estimated path coefficients and subsequently the statistical significance of these coefficients (Chin, 1998).

Results

The means, standard deviations, correlations, composite reliabilities, and average variance extracted (AVE) for the seven scales are presented in Table I. Composite reliability was used to measure the internal reliability of the constructs. The composite reliabilities of all the scales are greater than 0.8. In general, a composite reliability of 0.7 indicates satisfactory internal reliability (Yoon, 2009). The AVE is the average squared loading of the items that constitute a construct. An AVE that is greater than 0.5 indicates satisfactory convergent validity (Chin, 1998). As shown on the diagonal in Table I, the AVEs for all of the constructs are greater than 0.5 thereby indicating that all of the constructs have satisfactory convergent validity.

A construct has satisfactory discriminant validity if the square root of its AVE is larger than its correlations with the other constructs in the model (Chin, 1998). As shown in Table I, all of the constructs have satisfactory discriminant validity according to this criterion. Satisfactory discriminant validity between two constructs is also evident if the correlation coefficient between two constructs is less than 1 minus two times the standard error of the correlation coefficient (Bagozzi and Warshaw, 1990). According to this criterion, all of the constructs have satisfactory discriminant validity.

The findings from the PLS analysis for the outer model are presented in Table II. As shown in Table II, all of the items load satisfactorily on their respective latent constructs.

The findings from the PLS analysis for the inner model, which represents the hypothesized model, are presented in Table III. As shown in Table III, expected rewards has a negative relationship with attitude to knowledge sharing – *H1* is not supported. Expected association

Table I Means (standard deviations, SD), composite reliabilities (CR), correlations, and AVEs

	Mean	*SD*	*CR*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1. EA	3.4	1.0	0.87	0.58[a]						
2. EC	4.1	0.5	0.90	0.58	0.64[a]					
3. ER	4.0	0.6	0.90	0.07	0.18	0.75[a]				
4. AKS	4.1	0.6	0.90	0.55	0.47	−0.03	0.68[a]			
5. ISK	4.0	0.5	0.89	0.48	0.48	−0.02	0.68	0.62[a]		
6. ITUKS	2.8	1.0	0.81	0.11	0.22	0.09	0.13	0.18	0.59[a]	
7. KS	3.9	0.5	0.89	0.45	0.44	−0.07	0.57	0.72	0.20	0.62[a]

Notes: [a]AVEs are on the diagonal; *$r > 0.07$; $p < 0.05$; $r > 0.11$; $p < 0.01$; $r > 0.13$; $p < 0.001$ (one-tailed); EA = expected association, EC = expected contribution, ER = expected rewards; AKS = attitude to knowledge sharing, ISK = intention to share knowledge; ITUKS = IT usage for knowledge sharing, and KS = knowledge sharing

Table II PLS analysis outer model results

	Loading	t-*value*[a]
Expected association		
Item 1	0.73	20.86
Item 2	0.77	26.41
Item 3	0.81	38.92
Item 4	0.77	32.72
Item 5	0.82	17.45
Expected contribution		
Item 1	0.76	28.54
Item 2	0.71	25.51
Item 3	0.83	46.73
Item 4	0.86	53.79
Item 5	0.83	37.69
Expected reward		
Item 1	0.94	3.74
Item 2	0.91	5.26
Item 3	0.73	4.41
Attitude to knowledge sharing		
Item 1	0.83	41.60
Item 2	0.86	53.78
Item 3	0.81	30.18
Item 4	0.80	42.25
Intention to share knowledge		
Item 1	0.84	48.41
Item 2	0.77	32.50
Item 3	0.83	47.32
Item 4	0.78	31.71
Item 5	0.70	20.60
IT usage for knowledge sharing		
Item 1	0.78	14.45
Item 2	0.80	17.20
Item 3	0.72	8.67
Knowledge sharing		
Item 1	0.84	45.81
Item 2	0.75	23.14
Item 3	0.86	57.96
Item 4	0.76	29.03
Item 5	0.71	21.48

Note: [a]$p<0.001$ for all *t*-values

has a positive relationship with attitude to knowledge sharing – *H2* is supported. Expected contribution has a positive relationship with attitude to knowledge sharing – *H3* is supported.

H4 and *H5* were tested using PLS analysis with the procedure developed by Judd and Kenny (1981). According to Judd and Kenny (1981), a mediation hypothesis is supported if the following three conditions are met:

1. the independent variable significantly predicts the dependent variable (i.e. condition 1);
2. the independent variable significantly predicts the mediator variable (i.e. condition 2); and
3. when the mediator and the independent variable are used simultaneously to predict the dependent variable, the mediator predicts the dependent variable (i.e. condition 3) – a correlation between the mediator and the dependent variable is not sufficient evidence of mediation because both may be caused by the independent variable (Kenny *et al.*, 1998).

Table III PLS analysis results

Exogenous construct	*Endogenous construct*	*Path coefficient*	*Variance due to path*	R^2
Expected association	Attitude to knowledge sharing	0.42***	0.23	0.35
Expected contribution		0.25***	0.12	
Expected rewards		−0.12*	0.01	
Expected association	Intention to share knowledge	0.05	0.02	0.51
Expected contribution		0.20***	0.10	
Expected rewards		−0.03	0.00	
Attitude to knowledge sharing		0.57***	0.39	
Expected association	IT usage for knowledge sharing	−0.05	0.01	
Expected contribution		0.18**	0.04	
Expected rewards		0.05	0.00	0.06
Attitude to knowledge sharing		−0.01	0.00	
Intention to share knowledge		0.14**	0.027	
Expected association	Knowledge sharing	0.09*	0.04	
Contribution		0.08*	0.04	
Expected rewards		−0.09*	0.01	
Attitude to knowledge sharing		0.08	0.05	0.55
Intention to share knowledge		0.56***	0.40	
IT usage for knowledge sharing		0.08**	0.02	
AVA (average variance accounted for)				0.37

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Full mediation occurs when only the mediator predicts the dependent variable and partial mediation occurs when the mediator and the independent variable both predict the dependent variable (Baron and Kenny, 1986; Judd and Kenny, 1981). However, a mediation effect can occur even when condition 1 is not met (Kenny *et al.*, 1998).

Attitude to knowledge sharing significantly predicts IT usage to share knowledge ($\beta = 0.15$, $p < 0.001$: condition 1 met) and intention to share knowledge ($\beta = 0.69$, $p < 0.001$: condition 2 met). IT usage to share knowledge was then regressed on both attitude to knowledge sharing and intention to share knowledge ($\beta = 0.01$, $p > 0.05$ and $\beta = 0.19$, $p < 0.01$, respectively): condition 3 met. *H4* is therefore supported as intention to share knowledge fully mediates the relationship between attitude to knowledge sharing and IT usage to share knowledge.

Intention to share knowledge significantly predicts knowledge sharing ($\beta = 0.72$, $p < 0.001$: condition 1 met) and IT usage to share knowledge ($\beta = 0.21$, $p < 0.001$: condition 2 met). Knowledge sharing was then regressed on both intention to share knowledge and IT usage to share knowledge ($\beta = 0.70$, $p < 0.001$ and $\beta = 0.09$, $p < 0.001$, respectively): condition 3 met. *H5* is therefore supported as intention to share knowledge partially mediates the relationship between intention to share knowledge and knowledge sharing.

The Sobel test was used to test the hypothesized indirect effect of intention to share knowledge on knowledge sharing via IT usage to share knowledge. This test revealed the following:

- the indirect effect of expected association on intention to share knowledge via attitude to knowledge sharing is significant ($Z = 6.6$, $p < 0.001$);
- the indirect effect of expected contribution on intention to share knowledge via attitude to knowledge sharing is significant ($Z = 4.2$, $p < 0.001$);
- the indirect effect of expected rewards on intention to share knowledge via attitude to knowledge sharing is not significant ($Z = 1.8$, $p > 0.05$);
- the indirect effect of attitude to knowledge sharing on frequency of IT usage to share knowledge via intention to share knowledge is significant ($Z = 2.3$, $p < 0.05$); and

- the indirect effect of intention to share knowledge on knowledge sharing via frequency of IT usage to share knowledge is significant ($Z = 1.7$, $p < 0.05$).

The findings from the PLS analysis shown in Table III also reveal the following:

- Expected association, expected contribution, and expected rewards have significant unique effects on attitude to knowledge sharing with expected rewards having a negative effect.
- Only expected contribution and attitude to knowledge sharing have significant positive unique effects on intention to share knowledge and attitude to knowledge sharing has the strongest effect.
- Attitude to knowledge sharing mediates the relationships between expected association, expected contribution, and expected rewards and intention to share knowledge.
- Only expected contribution and intention to share knowledge have significant positive unique effects on it usage to share knowledge and intention to share knowledge has the strongest effect.
- All of the variables except for attitude to knowledge sharing have significant unique effects on knowledge sharing with expected rewards being unique in that it is the only one with a negative effect.

The strongest predictor of knowledge sharing is intention to share knowledge.

The hypothesis that use of IT to share knowledge moderates the relationship between intention to share knowledge and knowledge sharing was tested. Intention to share knowledge and use of IT to share knowledge were standardized and a product-term using the standardized versions of these variables was created in order to reduce multicollinearity between the product-term and its constituents (Baron and Kenny, 1986). The results from this analysis indicate that use of IT to share knowledge does not moderate the relationship between intention to share knowledge and knowledge sharing. For the product-term, $\beta = 0.02$, $p > 0.05$, $\Delta R^2 = 0.001$.

The hypothesis that expected rewards leads to a positive attitude towards knowledge sharing was not supported and was indeed contradicted. An exploratory analysis was therefore conducted to determine whether expected rewards moderates both the relationship between expected association and attitude towards knowledge sharing and the relationship between expected contribution and attitude towards knowledge sharing. A plausible rationale for expected rewards being a moderator is that expected rewards may enhance rather than augment the effects of expected association and expected contribution on attitude towards knowledge sharing. Product-terms were created using standardized versions of expected association, expected contribution, and expected rewards. The findings reveal that expected rewards does not moderate the relationship between expected association and attitude towards knowledge sharing nor the relationship between expected contribution and attitude towards knowledge sharing (for the product-terms, $\beta = -0.05$, $p > 0.05$, $\beta = 0.05$, $p > 0.05$, respectively, $\Delta R^2 = 0.002$).

Discussion

The attitude-intention-behavior chain is sometimes more complex than the causal chain proposed in the TRA. The role of using IT to share knowledge with regards to the relationship between intention to share knowledge and knowledge sharing was revisited. Specifically, whether the use of IT to share knowledge moderates or mediates this relationship was examined. The use of IT to share knowledge was found to partly mediate the relationship between intention to share knowledge and knowledge sharing.

Intention to share knowledge correlates positively to knowledge sharing, which is consistent with other studies (e.g. Bock and Kim, 2002). This finding supports the TRA, according to which, intentions are generally aligned with behaviors. The TRA is further supported by the

finding that of all the variables in the hypothesized model, intention to share knowledge best predicts knowledge sharing.

The hypothesized model contains three antecedents to attitude to knowledge sharing, two of which (i.e. expected association and expected contribution) are positively correlated to a favorable attitude to knowledge sharing and the other (i.e. expected rewards) negatively correlated. All three antecedents account for significant proportions of unique variance in attitude to knowledge sharing, with expected association being the best predictor. These findings are consistent with those reported by Bock and Kim (2002). Tohidinia and Mosakhani (2010) also found that expected rewards correlates negatively with attitude towards knowledge sharing.

The three antecedents to attitude to knowledge sharing represent three perspectives of knowledge sharing. Expected association represents the relational perspective, expected contribution the capability-membership perspective, and expected rewards the instrumental perspective. The findings can be used to infer that the three perspectives drive attitude towards knowledge sharing in different ways. The relational and capability-membership perspectives lead to a positive attitude towards knowledge sharing whereas the instrumental perspective leads to a negative attitude.

A possible explanation for the findings is that although all three perspectives can be construed as involving extrinsic motivators, the relational and capability-membership perspectives involve ties with other organizational members and the organization itself therefore providing the knowledge sharer with the intrinsic satisfaction that stems from having harmonious relationships with other members of the organization and knowing that one makes a positive difference to the organization. In contrast, the instrumental perspective, as represented by expected rewards, comprises extrinsic motivators that are determined by others. If extrinsic rewards are perceived as a form of control or a manifestation of formal authority, they can be de-motivating (Brandt, 1995) and possibly lead to a negative attitude to knowledge sharing.

Several recommendations for organizations can be made based on the findings. That the use of IT to share knowledge partially rather than fully mediates the relationship between intention to share knowledge and knowledge sharing is consistent with the notion that employees who intend to share knowledge will use various means, including IT, to do so. Organizations therefore need to use focus groups involving members from different departments or from large teams to ascertain which methods of sharing knowledge employees prefer. Organizations then need to ensure the preferred methods are available and supported. The findings can also be used to infer that organizations need to ensure that members have appropriate IT for knowledge sharing. Consequently, as is well documented in the literature, members need IT training and support.

Some forms of IT, such as bulletin board systems, not only facilitate the transfer of knowledge amongst organizational members but also create online communities of practice within the organization. These communities can have a strong positive impact on organizational performance for the following reasons:

- they reduce the time employees, especially knowledge workers, spend searching for information by expediting the process of contacting other employees in the organization who have the required information and thereby reduce the cost of obtaining specialized information; and
- they can help organizations to better utilize the knowledge it has thereby rendering employees more likely to find better solutions because they have easy access to a wider range of knowledge than they would without such communities.

Organizations should be encouraged to establish online communities for knowledge sharing because these communities can foster favorable attitudes to knowledge sharing. Online communities provide a means for members to demonstrate not only their expertise but also their commitment to the organization. Members who are perceived as capable and committed are likely to enhance their reputation and ultimately their status within the

organization. Increased status is likely to strengthen ties with other members of the organization. Strong ties are motivational because they are an important form of social capital. Online communities therefore provide a platform for members to increase their social capital and consequently increase the likelihood of a favorable attitude to knowledge sharing developing.

It is recommended that organizations publicly acknowledge the contribution and expertise of knowledge sharers because doing so can motivate employees to share knowledge. Public recognition will make members feel valued and respected thereby increasing their perceptions of expected contribution, which will facilitate the development of a favorable attitude to knowledge sharing. The findings indicate that organizations should be advised not to focus on extrinsic tangible rewards to promote knowledge sharing because this study is not the first study to show such rewards can adversely influence attitude to knowledge sharing. A possible reason for the negative influence of extrinsic rewards is that they can be regarded by employees as a form of control.

The findings indicate that IT plays an important role in knowledge sharing amongst individuals. However, the advancement and availability of IT is necessary but not sufficient for knowledge sharing to occur (Alavi and Leidner, 1999). Organizations need to implement not only proper knowledge-management technologies but also ensure that these technologies are compatible, match the needs and expectations of employees, and that employees are properly trained and provided with technical support (Zawawi *et al.*, 2011). Organizational culture influences the successful implementation of IT (Orlikowski, 1993; Ruppel and Harrington, 2001). It is therefore assumed that organizational culture influences not only the types of knowledge that should be transferred (e.g. norms of communication and knowledge sharing; Zaidman and Brock, 2009) but also attitudes toward using IT to share knowledge and advocate the creation of organizational cultures that encourage employees to use IT for knowledge sharing.

Limitations and future research

The study has several limitations. Knowledge sharing was considered only at the individual level. It seems worthwhile to re-examine the hypothesized conceptual model in the context of knowledge sharing between groups such as business units and organizations. Causal relationships cannot be inferred from the findings because the data are cross-sectional. The problems faced by researchers procuring longitudinal data are considerable but such data can shed light on the causal nature of the hypothesized relationships. Self-ratings tend to be influenced by social desirability thereby bringing into question the validity of the findings. Objective measures for knowledge sharing, however, are difficult to develop.

All of the data are self-reported, from a single source and were obtained using the same method (i.e. a five-point Likert scale) at the same time. The correlations between the variables may therefore be accentuated because of common method variance (CMV). A principal components analysis was conducted on the items that were used to measure expected association, expected contribution, expected rewards, attitude to knowledge sharing, intention to share knowledge and frequency of use of IT to share knowledge and knowledge sharing to check for the effects of CMV.

Principal component analysis was chosen because its purpose is to create weighted linear combinations of the items to explain the variance in the items and, more specifically, to create a first component that maximizes the amount of explained variance (Hair *et al.*, 1998). If CMV is substantial, then the majority of the variance in the items should be explained by the first component (Podsakoff *et al.*, 2003). This analysis revealed that the first component explains 30.8 per cent of the total variance in the items thereby indicating that CMV is not substantial.

When there is considerable CMV, there should be a significant baseline level of correlation between the variables (Spector, 2006) and therefore multicollinearity amongst the exogenous constructs. As shown in Table II, several of the variables have non-significant

correlations. The tolerance (T) and variance inflation factor (VIF) for the exogenous constructs indicate that there is not high multicollinearity:

- expected association (T = 0.562, VIF = 1.78);
- expected contribution (T = 0.570, VIF = 1.75);
- expected rewards (T = 0.903, VIF = 1.11);
- attitude to knowledge sharing (T = 0.451, VIF = 2.22);
- intention to share knowledge (T = 0.484, VIF = 2.07); and
- IT usage to share knowledge (T = 0.924, VIF = 1.08).

When there is high multicollinearity, the likelihood of exogenous constructs having significant unique effects on an endogenous variable is low. As shown in Table III, five of the six exogenous constructs are significant predictors of knowledge sharing thus providing further evidence that CMV is not problematic in this study.

Although it was beyond the scope of this study, it appears worthwhile for future research to examine the different means by which employees share knowledge and whether the relative importance of these different means depends on factors such as the type of knowledge to be shared and the complexity of the knowledge. For example, complex tacit knowledge is arguably less likely to be shared via IT than simple explicit knowledge.

The knowledge receiver's level of role competence and IT competence relative to the knowledge sharer may also be important determinants of the use of IT to share knowledge. For example, when the knowledge receiver has considerably less role competence and less IT competence compared to the knowledge sharer, a face-to-face meeting might be more likely than IT to be used to share the knowledge.

IT is sometimes not heavily relied upon to share organizational knowledge because knowledge owners and knowledge receivers are not competent with the IT involved in the knowledge-sharing process (Antonova *et al.*, 2011). Future studies can be conducted to explore the extent to which training in relevant IT enhances the use of IT to share knowledge.

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Appendix. Items used to measure the key variables

Expected association

- Item 1: my knowledge sharing would strengthen the ties between existing members and myself in the organization.
- Item 2: my knowledge sharing would get me well-acquainted with new members in the organization.
- Item 3: my knowledge sharing would expand the scope of my associations with other members in the organization.
- Item 4: my knowledge sharing would draw smooth co-operation from outstanding members in the future.
- Item 5: my knowledge sharing would create strong relationships with members who have common interests in the organization.

Expected contribution

- Item 1: my knowledge sharing would help other members in the organization to solve problems.
- Item 2: my knowledge sharing would create new business opportunities for the organization.
- Item 3: my knowledge sharing would improve work processes in the organization.
- Item 4: my knowledge sharing would increase the productivity in the organization.
- Item 5: my knowledge sharing would help the organization to achieve its performance objectives.

Expected rewards

- Item 1: I expect to receive monetary rewards in return for sharing my knowledge.
- Item 2: I expect to receive additional points for promotion in return for my knowledge sharing.
- Item 3: I expect to receive an honor or educational opportunity in return for my knowledge sharing.

Attitude to knowledge sharing

- Item 1: I think it is a good idea to share my knowledge with other members of my organization.
- Item 2: I enjoy sharing my knowledge with other members of my organization.
- Item 3: my knowledge sharing with other organizational members is valuable to me.
- Item 4: my knowledge sharing with other organizational members is a wise move.

Intention to share knowledge

- Item 1: I will share my knowledge with other organizational members.
- Item 2: I will always provide my knowledge at the request of other organizational members.
- Item 3: I intend to share my knowledge with other organizational members in the future.
- Item 4: I try to share my knowledge with other organizational members in an effective way.
- Item 5: I will share my knowledge with anyone in the organization if it is helpful for the organization.

Information technology usage for knowledge sharing

- Item 1: the frequency of using bulletin board system/forum to share knowledge.
- Item 2: the frequency of using emails to share knowledge.
- Item 3: the frequency of using web pages to share knowledge.

Knowledge sharing

- Item 1: I always share my knowledge with other organizational members.
- Item 2: I always share my knowledge at the request of other organizational members.
- Item 3: I always share my knowledge with other organizational members in the future.
- Item 4: I always share my knowledge with other organizational members in an effective way.
- Item 5: I always share my knowledge with anyone in the organization when it is helpful for the organization.

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