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Understanding online knowledge sharing: An interpersonal relationship perspective

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Abstract: The unique features and capabilities of online learning are built on the ability to connect to a wider range of learning resources and peer learners that benefit individual learners, such as through discussion forums, collaborative learning, and community building. The success of online learning thus depends on the participation, engagement, and social interaction of peer learners, which leads to knowledge sharing. Thus, without frequent and persistent interaction, it is doubtful whether knowledge sharing can take place in online learning. This study argues that theories about the development and maintenance of social relationships provide a theoretical foundation for understanding the motivation to engage in online knowledge sharing behavior. An Online Knowledge Sharing Model (OKSM) is proposed and empirically tested among undergraduate students using an online learning environment. The model introduces two new constructs – Perceived Online Attachment Motivation (POAM) and Perceived Online Relationship Commitment (PORC), which together explained 71 percent of the variance observed in self-reported online knowledge sharing behavior. The findings provide some explanations for the motivation to share knowledge, and have several implications for the design of the features and capabilities of online learning environments.

Keywords: Computer mediated communication, learning communities, media in education, pedagogical issues

1. Introduction

Knowledge sharing is a critical step in knowledge acquisition. The post positivist perspective of knowledge considers knowledge sharing to be a consensual understanding situated in everyday experience (Peters & Burbules, 2004), and holds that knowledge is negotiated among a number of individuals to reach a consensus. Knowledge does not possess inherent meaning, but must be interpreted within the context in which one encounters and uses it. Knowledge is also embedded in practice (Wenger, 1998). And according to the communities of practice theory, engagement in social practice is the fundamental process by which humans learn. These ideas suggest that learning is a process of social participation, a notion that is further supported by the fact that learner participation is associated with positive effects on learning, satisfaction, and retention (Hrastinski, 2009). Learner participation and social interaction appear in various patterns, including collabora- tion, dialogue, reflection, connection to context, and transferability of knowledge (Löfström & Nevgi, 2007).

The key challenge in online learning is to encourage knowledge sharing through social interaction, participation, and engagement in various forms. It is commonly argued that the use of educational technology improves learner participation and interaction in both traditional and online learning (e.g., Haythornthwaite, 2002). Empirical studies of online learning often measure online knowledge sharing in terms of participation and its relationship to learning. For example, online discussions have been examined by assessing messages posted by learners (e.g., Mazzolini

& Maddison, 2007); collaborative learning environments have been investigated by assessing interactional activity, participation patterns, and their effects on performance (Kapur & Kinzer, 2007); and collaboration environments supported by different levels of technology have been assessed by investigating the extent to which learners share knowledge and the resulting effect on individual outcomes (e.g., Fischer & Mandl, 2005). Knowledge-building communities have been studied by investigating the knowledge sharing of learners with other members of the community (Zhang, Scardamalia, Lamon, Messina, & Reeve, 2007). All of the empirical evidence in these studies indicates how the full utilization of an online learning environment can improve online knowledge sharing.

However, recent studies have also found that instructors and students are not always fully engaged in an active or sustained manner in activities that use information technology (Reffell & Whitworth, 2002), and other studies have found that learner participation varies significantly across individual courses and individual institutions (e.g., Marriott, Marriott, & Selwyn, 2004). These inconsistent results brings into question whether the presence of education technology alone is sufficient to facilitate online knowledge sharing among learners. To conceptualize the motivation for sharing knowledge in online learning, it is important to gain a better understanding of learners' needs. This study thus aims to determine the emergent motivational factors that drive online knowledge sharing.

This paper is organized as follows. In the literature review section, the relevant empirical literature on interpersonal relationships and online knowledge sharing processes is reviewed and analyzed. Drawing on existing empirical studies, a motivational online knowledge sharing model (OKSM) is then proposed. In the next section, an empirical study is designed to validate two proposed constructs – Perceived Online Attachment Motivation (POAM) and Perceived Online Relationship Commitment (PORC) – and to test the model. The results of the findings are then discussed with reference to their academic and practical implications.

2. Literature review

2.1 Online learning, social interaction and knowledge sharing

A review of recent empirical studies identifies several streams of research into online learning that deal with knowledge sharing. The first stream considers online learning that is provided through a shared platform on which peer learners interact, often in the form of discussion forums, and in which knowledge sharing occurs through the continuous interaction of asynchronous written communication among peer learners (Mazzolini & Maddison, 2007). The second stream examines online learning in shared workplaces that allow peer learners to interact to complete a common task, in which knowledge sharing occurs through the continuous interaction of learning by doing among peer learners (Kapur & Kinzer, 2007). Yet another stream holds that online learning provides a transparent demonstration of individual outcomes, and that knowledge sharing occurs through continuous exposure to best practices and learning by observation among peer learners (Fischer & Mandl, 2005). Finally, research has also highlighted that online learning provides a centralized meeting place for community building, and that knowledge sharing occurs naturally in the presence of human resources and expertise (Zhang et al., 2007).

All of these research streams highlight that two of the key success factors in online learning are the connecting of peer learners and their engagement in knowledge sharing behavior. Hence, much online learning research is concerned with the development of theories and techniques that help practitioners to facilitate the meeting and sharing of knowledge among learners. In a narrower context, an important research direction is concerned with developing theories and techniques that

help practitioners to understand the motivation for learners to share knowledge and to predict their knowledge sharing behavior in online learning environments.

2.2 Knowledge sharing in the learning process

The unique features and capabilities of online learning environments to support and facilitate peer learner interaction and online knowledge sharing have strong support in several theories on the learning process. A popular socio-cultural theory of learning is that of Vygotsky (1978), who suggested a general genetic law of cultural development that explains the mechanism by which knowledge is acquired and represented through knowledge sharing and social interaction. This mechanism has two planes: the social/individual and the public/private. Learning starts on the social plane, with learners acquiring new concepts and strategies through interactions with more knowledgeable others. Individual learners then use and extend the concepts and strategies to other contexts, and meanings and interpretations are initiated through social interactions (social to individual). Learning then emerges in the public domain, with the knowledge being used by more knowledgeable others and made available to learners. Through interactions within the public domain, individual learners understand, adjust, and implement the knowledge that they have learned in the private domain (public to private).

In other theories of social learning, Webb and Palincsar (1996) applied the reciprocal teaching process developed by Palincsar and Brown (1984) to describe how knowledge sharing takes place during learning. Harre (1984) and Wertsch and Bivens (1992) concluded that the success of learning is based on the assumptions that knowledgeable members of a culture will assist others to learn and that learners will actively engage in learning activities so that higher mental functions take place. To conclude, social interactions initiate among individual learners and naturally knowledge sharing results from these social interactions. However, none of these theories addresses the fundamental question of what drives learners to interact and hence share knowledge during learning.

2.3 The need to belong as the innate motivation to social interaction

A review of prior literature suggests that the theory of the need to belong may explain the motivation to frequent and regular social interaction. The theory of "the need to belong" suggests that the social interaction is an innate human motivation. The theory was proposed by Baumeister and Leary (1995), who defined the need to belong as "*a need to form and maintain at least a minimum quantity of interpersonal relationships,* [*which*] *is innately prepare* (*and hence nearly universal*) *among human beings*" (p. 499). According to this theory, people are naturally driven toward establishing and sustaining belongingness. Thus, the theory of the need to belong may explain the motivation for social interaction in learning through the mechanisms of affiliation motivation (to form social bonds) and relationship commitment (to maintain those bonds).

The need to belong stimulates goal-directed activities designed to satisfy it. Motivated by the social goal of satisfying the need to belong, people show a tendency to seek out interpersonal contacts and cultivate possible relationships, and continue doing so until they have reached a minimum level of social contact and relatedness. This social goal affects every aspect of an individual's cognitive and emotional processes, including learning. Because of these tendencies, social bonds should form easily, readily, and without requiring highly particular or conducive settings. Further, cognitive activity should reflect a pervasive concern with forming and maintaining relationships. Emotional reactions follow directly from outcomes that pertain to the need to belong, with positive affect following the

formation and solidification of social bonds and negative affect ensuing when relationships are broken, threatened, or refused.

2.3.1 Attachment motivation

People in almost every society belong to small primary groups that engage in face-to-face and personal interactions (e.g., Mann, 1980). Indeed, the anthropologist Coon (1946) suggested that the formation of natural groups is a characteristic of all human beings. Previous studies have found that group cohesion is developed as long as social bonds exist (e.g., Sherif, Harvey, White, Hood, & Sherif, 1988), but other studies show that within-group favoritism does not need a reason, even when group members are assigned at random (Billig & Tajfel, 1973), and may appear as soon as a group is formed (Tajfel, Billig, Bundy, & Flament, 1971; Turner, 1985) without reasons of inferred self-interest (e.g., Tajfel & Billig, 1974).

Bowlby (1969) upheld the importance of forming social bonds, and defined what he called this "attachment motivation" as "*a personality attribute that reflects an individual's desire for social interaction and a sense of communion with others*." He later explained that without attachment, an individual is separated from others, feels anger, and is at a loss and full of anxiety (Bowlby, 1973). Further supporting the human need to form social bonds with others, Reis and Patrick (1996) suggested that people feel safe with each other, which is why they actively seek support from their social network. Hill (1987) posited that the motivation for social contact is the central influence on human behavior, defining the desire for social contact as "affiliation motivation." However, he proposed that people need other people for different reasons, and developed an instrument to measure affiliation motivation based on previous studies (e.g., Foa & Foa, 1974; Veroff & Veroff, 1980). The instrument comprises four specific social rewards, including positive affect or stimulation associated with interpersonal closeness and communion; attention or praise reward; reduction of negative affect through social contact; and social comparison. These social rewards are argued to be the primary motivation to social interaction and to form relationships.

2.3.2 Relationship commitment

Interactions with strangers may be the first steps toward a long-term relationship, but people will not be satisfied with mere interactions with strangers or with others that they dislike. Frequent contact with non-supportive, indifferent others does not help an individual's general well-being and does little to satisfy the need to belong. Weiss suggested that feelings of loneliness may be due either to an insufficient amount of social contact (social loneliness) or to a lack of meaningful, intimate relatedness (emotional loneliness) (Shaver & Buhrmester, 1983; Weiss, 1973). Thus, the need to belong is the need for regular social contact with those to whom one feels connected.

Research has concluded that the tendency for human beings to respond with distress to the end of a relationship is nearly universal, even across different cultures and generations (Hazan & Shaver, 1994). Empirical studies have also found that members of a group resist the notion that the group will dissolve, even though they understand early on that the group will end at a certain point in the future (e.g., Lieberman, Yalom, & Miles, 1973). People show signs of distress over impending separation due to external transitions (Bridges, 1980), and may not want to risk damaging a relationship even with perfect strangers (Kunz & Woolcott, 1976). Because of the fear of negative affect from ending a relationship, people are often reluctant to dissolve even bad or destructive relationships (e.g., Strube, 1988). Interdependence theory provides further support for the tendency

of human beings to persist with a relationship (e.g., Thibaut & Kelly, 1959), defining the level of dependence in a relationship as the extent to which an individual "needs" the relationship or relies uniquely on the relationship to attain certain desired outcomes. Based on interdependence theory, Rusbult, Martz, and Agnew (1998) proposed that commitment is the key to understanding why some relationships persist and others do not, where commitment is defined as *the intent to persist with a relationship*. In another study, (Rusbult & Farrell, 1983) defined relationship commitment as "*an individual's intrinsic motivation to persist in a relationship*." Relationship commitment has been found to be an important determinant of friendship and close relationships, and to be necessary in organizational settings (e.g., Meyer, Allen, & Sulsky, 1999; Rusbult, Drigotas, & Verette, 1994). The prior findings show that the greater an individual's need to maintain a relationship, the more that individual will be committed to the relationship, the individual will then spend more time and effort in consistent and continual interaction with the relationship partners. These empirical studies thus provide both a theoretical furthering and empirical support for the theory of the "need to belong" and the tendency of human beings to maintain relationships that motivate an individual to keep regular and frequent social interaction with the relationship partners.

2.4 Summary

Based on the foregoing literature review, it can be argued that knowledge sharing through participation and social interaction is an important facilitator of knowledge acquisition, and hence of learning. However, the key issue of why learners participate and interact in learning has not been clearly explained in the previous studies. A search of the psychology literature suggests that the theory of the need to belong may explain the motivation for participating and interacting in learning through the mechanisms of *affiliation motivation* (to form social bonds) and *relationship commitment* (to maintain those bonds). In previous empirical studies of online learning, the mixed results on participation and interaction among students using online education technology are not fully explained. It would thus be valuable to explore whether the theory of the need to belong could provide a new perspective on participation and knowledge sharing in online learning, and it is this question that this paper addresses through the development and testing of a new online knowledge sharing model.

3. Model framework and hypothesis development

As shown in Fig. 1, the Online Knowledge Sharing Model (OKSM) includes the constructs of Perceived Online Attachment Motivation (POAM), Perceived Online Relationship Commitment (PORC), and Online Knowledge Sharing Behavior (OKSB). Individual online knowledge sharing behavior is defined as "*the online communication of knowledge so that knowledge is learned and applied by an individual*" (Argote, 1999; Brown, Dennis, & Gant, 2006; Darr & Kurtzberg, 2000; Ko, Kirsch, & King, 2005). Knowledge sharing behavior occurs when learning takes place in an online learning context when the individual learner understands the details and implications associated with that knowledge so that he or she can apply it. It is not confined to conversations or meetings, but also includes observations, imitations, and practice through the use of online learning platforms. Moreover, knowledge sharing is complex and complicated. It is difficult to measure by simply counting the frequency of interactions (Ramos & Yudko, 2008). Prior studies suggest that the best way is to ask respondent to self- report knowledge sharing behaviour (Brown et al., 2006). The other two constructs are defined in the following subsections.

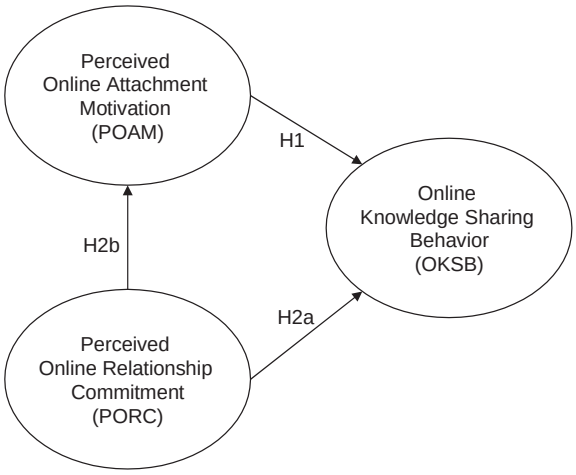

Fig. 1. Online Knowledge Sharing Model (OKSM).

3.1 Perceived online attachment motivation

Perceived Online Attachment Motivation refers to "*the degree to which an individual believes that he or she can improve his or her social interaction and the sense of communion with others on an online learning platform.*" If an individual learner expects to have strong social interactions in an online learning community, then he or she will be more willing to develop a relationship with other members in that community. To develop a relationship, he or she will be more willing to engage in greater interaction with other members in the online learning community, using such devices as small talk, certain forms of address, communicative norms, and self-disclosure. In online learning communities, all learners share the common goal of learning, and thus sharing one's knowledge is a good way to develop relationships. This leads to the following hypothesis.

> H2: The perceived attachment motivation of an individual learner on an online learning platform will have a positive effect on his or her knowledge sharing behavior on the online learning platform.

3.2 Perceived online relationship commitment

Relationship commitment reflects *an individual's internal perception of dependence on an established relationship*. Therefore, in this study, Perceived Online Relationship Commitment is defined as "*the degree to which an individual believes that he or she can persist in a relationship with others on an online learning platform*." The greater an individual's need to persist with an established relationship, the more that individual will be committed to the relationship, as manifested by spending more time and effort in consistent and continual interaction with the relationship partners. In a learning community, learners engage in establishing relationships with other members in the learning community. Sharing is a means of establishing close relationships, and can be viewed as a kind of social support and a form of prosocial behavior. In the process of maintaining established relationships, individual learners become more willing to share with other members of the online community. Knowledge sharing thus comes to be viewed as a positive act that benefits

the sharing parties. This leads to the following hypothesis.

> H2a: The perceived online relationship commitment of an individual learner on an online learning platform will have a positive effect on his or her knowledge sharing behavior on the online learning platform.

Concerns about belonging are a powerful factor shaping human thought. People interpret situations and events in terms of their implications for their relationships with others, and think more thoroughly about relationships and interaction partners than about other people. Thus, both actual and potential bonds exert substantial effects on the way in which people think (Baumeister & Leary, 1995). It is thus likely that an individual learner's perceived online attachment motivation is affected by the learner's perceived online relationship commitment. Specifically, the more an individual learner is engaged in the learning community, the greater the sense of belonging to the learning community. This then gives rise to a switching cost, in that the more the learner contributes to the learning community, the higher the cost of switching to another community, as the learner will have nothing once he or she leaves. Therefore, individual learners will perceive a stronger attachment to an online learning community when they are more committed to that community. This gives rise to the following hypothesis.

> H2b: The perceived relationship commitment of an individual learner on an online learning platform will have a positive effect on his or her perceived attachment motivation on the online learning platform.

4. Methods

4.1 Research design

The aim of this research is to understand the motivational factors of knowledge sharing in online learning environments. As noncognitive traits such as personality, attitude, value, feelings, and beliefs are difficult to observe directly, the best way to measure their effect on the factor of interest is to ask study participants about them directly. Thus, noncognitive instruments are extensively used in educational research to measure traits (McMillan & Schmacher, 1989). Following this approach, this study adopts the quantitative method of a survey instrument to obtain self-reported information from the subjects.

4.2 Subjects

Selected courses were included in this study. First, only courses employed online learning platform were considered. Second, those courses with the most students enrolled were given priority. It was found that at all year levels and at all departments, English language courses enrolled the most students. The courses were counter checked with the usage log to make sure that the online learning platform was really in use and the courses were regularly updated. It was then going on to select some more courses. However, it was also checked that students would not be chosen more than once. Finally, MIS and Accounting courses were selected (see Table 1). Five hundred and eighty-one undergraduate students who were enrolled in different courses and used an online learning environment – the Interactive Learning Network (ILN) – of a local university were administered the survey instrument. Most were freshmen (37% were in Year 1; 26.8% in Year 2, 26.8% in Year 3, and 9.3% in Year 4 (final year)). The participants had been using the ILN platform for an average of 2.05

years (SD 0.993). The average age of the participants was 20.90 years old. The gender distribution is listed below (see Table 1).

4.3 Data collection

We first checked with the Registration Office of the university that the instructors on the courses in which the subjects were enrolled employed the online learning platform to support teaching and learning. Near the end of the academic year, we went to these classes to administer the paper questionnaire instrument. The students were given a letter stating the aim of the study, and were assured that participation in the survey was purely voluntary and that they could stop at any time they wished. On average, the subjects took about 10 min to complete the survey instrument, and all of them completed it within 20 min. On submitting a completed questionnaire, the subjects were given a small gift of a highlighter (valued at HKD1.00) as a token of appreciation. It took two weeks' time to administer the questionnaires to all of the subjects. There were in total 18 classes with 659 students enrolled in these classes. Out of the 581 replied, the response rate was 88.2%.

4.4 Measures

We operationalized the constructs in our model by using measurements validated by previous studies. The wording for the items was revised to reflect the target learner and online learning context. The items for each construct are listed in Appendix A, together with their sources. Perceived Online Attachment Motivation, defined as "*the degree to which an individual believes that he or she can improve his or her social interaction and the sense of communion with others on an online learning platform*," contained five items (Hill, 1987), Perceived Online Relationship Commitment, defined as "*the degree to which an individual believes that he or she can persist in a relationship with others on an online learning platform*," contained five items (Rusbult et al., 1998), and Online Knowledge Sharing Behavior, defined as "*the online communication of knowledge so that knowledge is learned and applied by an individual*," also contained five items (Ko et al., 2005). All question items were measured using a seven-point Likert scale that ranged from 1 (strongly disagree) to 7 (strongly agree). The items were randomly arranged to reduce the occurrence of a potential ceiling or floor effect that could have induced a homogenous response from the subjects.

4.5 Data analysis

A descriptive analysis of the instrument, including the means and standard deviations, is presented in Table 2. The inter-items correlations are presented in Table 3. The internal consistency of the instrument was examined using Cronbach's alpha, and the construct validity (discriminant and convergent validity) of the items was assessed by confirmatory factor analysis using LISREL. The model structure was then evaluated against goodness-of-fit indices, and the predictive and explanatory power calculated.

5. Results

5.1 Reliability and construct validity

Validity is the degree to which a measure accurately represents what it is supposed to represent,

whereas reliability is the degree to which the observed variable measures the "true" value and is "error free" (Hair, Black, Babin, Anderson, & Tatham, 2006).

Table 1
Demographics and Characteristics of the Subjects.

Courses using ILN	Male	Female	Not reported
English (336)	98	237	1
MIS (124)	62	62	0
Accounting (121)	54	67	0
Sub-total	214	366	1
Total (*N*) = 581			

Table 2
Descriptive Analysis of the Instrument.

Perceived Online Attachment Motivation (POAM)	*M* (*SD*)	Perceived Online Relationship Commitment (PORC)	*M* (*SD*)	Online Knowledge Sharing Behavior (OKSB)	*M* (*SD*)
POAM1	3.48 (1.175)	PORC1	3.70 (1.181)	OKSB1	3.94 (1.261)
POAM2	3.52 (1.120)	PORC2	3.75 (1.222)	OKSB2	3.96 (1.267)
POAM3	3.66 (1.136)	PORC3	3.32 (1.141)	OKSB3	3.98 (1.206)
POAM4	3.82 (1.149)	PORC4	3.56 (1.214)	OKSB4	4.08 (1.223)
POAM5	3.79 (1.139)	PORC5	4.14 (1.119)	OKSB5	3.89 (1.198)
Reliability Alpha	0.88	Reliability Alpha	0.83	Reliability Alpha	0.92

*N = 581.

Cronbach's alpha is generally the most appropriate type of reliability measure for survey research in which there is a range of possible answers for each item (McMillan & Schmacher, 1989). The Cronbach's alpha values for each of the constructs all exceeded the suggested threshold value of 0.7 (Nunnally & Bernstein, 1994), ranging from 0.83 to 0.92. This indicates that the constructs were internally consistent.

The measurement model and constructs were assessed using confirmatory factor analysis with LISREL 8.5 and a sample correlation matrix for scale validation. Confirmatory factor analysis combines ex ante theoretical expectations with empirical data for factor validation, and is therefore a stronger statistical method than alternative approaches such as exploratory factor analysis (Jöreskog & Sörbom, 1993; Kelloway, 1998). The confirmatory factor analysis was performed on the data with the item correlation matrix as the input and the maximum likelihood as the model estimation technique. The measured factor loadings of the construct items were all significant ($p < 0.001$), which means that they were explained more by the hypothesized construct than by error (Hair et al., 2006)(see Table 4 below).

5.2 Model testing results

The online knowledge sharing behavior model (OKSB) and the corresponding hypotheses were then examined using structural equation modeling. The analysis follows a series of steps to compare competing models. First, the model is used to estimate the causal relationship between POAM and OKSB, then PORC and OKSB, then POAM and PORC respectively, and OKSB. Finally, an additional path is added from PORC to POAM. The testing results show that the final model fits the data better than the previous competing models. The results of the final model testing produced a list of goodness-of-fit indices, including a Root Mean Square Residue (RMR) of 0.033 (<0.1), a Root Mean Square Error of Approximation (RMSEA) of 0.061 (<0.1), and a Goodness of Fit Index (GFI) of 0.95. All of these and the other indices exceeded the suggested values (see Table 5), indicating that the model fit the data well. Therefore, although both POAM and PORC are strongly correlated with OKSB, POAM is the primary whereas PORC is the second determinant. Hence, the desire of an individual to maintain a stable and secure social bond will lead to an increase in the individual's level of social interaction and communion with others in an online learning environment.

The explanatory power of the model for individual constructs was examined using the resulting R^2 for each dependent construct. Together, Perceived Online Attachment Motivation and Perceived Online Relationship Commitment explained 71 percent of the variance observed in Online Knowledge Sharing Behavior. Perceived Online Attachment motivation appeared to contribute more to the observed explanatory power than Perceived Online Relationship Commitment. At the same time, Perceived Online Relationship Commitment accounted for 80 percent of the variance observed in Perceived Online Attachment Motivation.

The predictive power of the model was examined and the postulated hypotheses tested based on the path coefficients between the constructs. The data supported most of the causal paths in the postulated model. Perceived Online Attachment Motivation (POAM) had a significant direct positive effect on Online Knowledge Sharing Behavior (OKSB), with a standardized path coefficient of 0.84 ($p < 0.001$). Hypothesis H1 was thus supported, as the coefficient suggested that every unit increment in Perceived Online Attachment Motivation would strengthen an individual's Online Knowledge Sharing Behavior by 0.84 units. Although Perceived Online Relationship Commitment (PORC) was found to be non-significantly associated with Online Knowledge Sharing Behavior (OKSB) (b 0.084, n-s), thus refuting hypothesis H2a, Perceived Online Relationship Commitment (PORC) had a significant direct positive effect on Perceived Online Attachment Motivation (POAM) (b 0.90, $p < 0.001$), thus supporting hypothesis H2b. Again, this indicates that every unit increment in Perceived Online Relationship Commitment would strengthen an individual's Perceived Online Attachment Motivation by 0.90 units. The non-significant relationship between Perceived Online Relationship Commitment and Online Knowledge Sharing Behavior indicates that Perceived Online Attachment Motivation (POAM) fully mediated the effect of Perceived Online Relationship Commitment (PORC) on Online Knowledge Sharing Behavior (OKSB). Thus, Perceived Online Relationship Commitment had only an indirect effect through the mediation of Perceived Online Attachment Motivation on an individual's Online Knowledge Sharing Behavior, with a total effect of 0.76 (b 0.90 0.84). These effects are summarized in Fig. 2 and Table 6.

Table 3
Pearson's Inter-Item Correlation Coefficients of Constructs.

	POAM1	POAM2	POAM3	POAM4	POAM5	PORC1	PORC2	PORC3	PORC4	PORC5	OKSB1	OKSB2	OKSB3	OKSB4	OKSB5
POAM1	**1**														
POAM2	**0.60****	**1**													
POAM3	**0.56****	**0.58****	**1**												
POAM4	**0.57****	**0.60****	**0.72****	**1**											
POAM5	**0.52****	**0.53****	**0.59****	**0.66****	**1**										
PORC1	0.46**	0.49**	0.49**	0.51**	0.42**	**1**									
PORC2	0.43**	0.43**	0.49**	0.49**	0.45**	**0.63****	**1**								
PORC3	0.49**	0.49**	0.52**	0.52**	0.51**	**0.56****	**0.55****	**1**							
PORC4	0.60**	0.54**	0.62**	0.55**	0.51**	**0.49****	**0.49****	**0.45****	**1**						
PORC5	0.31**	0.33**	0.37**	0.36**	0.36**	**0.47****	**0.52****	**0.40****	**0.34****	**1**					
OKSB1	0.47**	0.53**	0.55**	0.56**	0.52**	0.49**	0.48**	0.51**	0.49**	0.33**	**1**				
OKSB2	0.52**	0.50**	0.61**	0.62**	0.60**	0.50**	0.52**	0.53**	0.56**	0.39**	**0.67****	**1**			
OKSB3	0.52**	0.51**	0.61**	0.63**	0.60**	0.50**	0.49**	0.53**	0.53**	0.35**	**0.65****	**0.80****	**1**		
OKSB4	0.48**	0.52**	0.59**	0.63**	0.57**	0.49**	0.51**	0.50**	0.54**	0.34**	**0.69****	**0.84****	**0.77****	**1**	
OKSB5	0.54**	0.58**	0.60**	0.62**	0.58**	0.50**	0.50**	0.52**	0.52**	0.36**	**0.58****	**0.66****	**0.67****	**0.66****	**1**

** $p < 0.01$.

Table 4
Confirmatory Factor Analysis of the Online Knowledge Sharing Model Constructs.

Perceived Online Attachment Motivation (POAM)	Factor Loadings	Perceived Online Relationship Commitment (PORC)	Factor Loadings	Online Knowledge Sharing Behavior (OKSB)	Factor Loadings
POAM1	0.69***	PORC1	0.82***	OKSB1	0.76***
POAM2	0.72***	PORC2	0.85***	OKSB2	0.93***
POAM3	0.80***	PORC3	0.70***	OKSB3	0.90***
POAM4	0.83***	PORC4	0.62***	OKSB4	0.93***
POAM5	0.75***	PORC5	0.64***	OKSB5	0.74***

$N = 581$; ***$p < 0.001$.

6. Discussion

6.1 Summary of the fi*ndings*

The aim of this study is to determine the factors that facilitate online knowledge sharing, and hence to develop an understanding of the factors that promote the online knowledge sharing behavior of learners. The findings confirm the proposed model, which is based on the theory that the desire to develop and the tendency to maintain social relationships are the major determinants of the knowledge sharing behavior of individual learners in the online learning context. The proposed factor structures of the Online Knowledge Sharing Model were validated with the sample data, and the corresponding hypotheses were mainly supported, except that Perceived Online Relationship Commitment was fully mediated by Perceived Online Attachment Motivation and showed only an indirect significant effect on online Knowledge Sharing Behaviour. The survey results show that the construct of Perceived Online Attachment Motivation is a powerful factor associated with individual knowledge sharing behavior among online learners. Further, the Perceived Online Relationship Commitment of individual learners strengthens their Perceived Online Attachment Motivation and hence affects their online knowledge sharing behavior.

6.2 Theoretical contributions

This study has several theoretical implications. The first is that the results are consistent with the theories on which the model is based, namely, the need to belong, attachment motivation, and relationship commitment theories (Baumeister & Leary, 1995; Hill, 1987; Rusbult et al., 1998). The theory of the need to belong predicts that social bonds should form relatively easily without requiring specifically conducive circumstances, and that people are generally reluctant to break social bonds. People thus engage in various patterns of behavior to form and maintain social bonds, such as increasing their contact with others contact, seeking closeness, inducing cooperation, and sharing good and bad experiences. This basic need to belong predicts a variety of types of prosocial behavior. In the context of this study, the need to belong theory predicts the likelihood of knowledge sharing among individual learners, and the model based on this theory shows that the formation of online social bonds by individual learners mediates online relationship commitment and online knowledge sharing behavior. The theory of the need to belong also hypothesizes that basic cognitive patterns reflect a fundamental concern with social relationships. Consistent with this prediction, this study finds that having stronger online relationship commitment stimulates the need to form relationships and consequently the willingness to share knowledge online (Pryor & Ostrom, 1981; Sedikides, Olsen, & Reis, 1993).

The second theoretical implication of this study is the validation of two new constructs. Based on the aforementioned theories, two new constructs have been developed – Perceived Online Attachment Motivation (POAM) and Perceived Online Relationship Commitment (PORC) – to predict online knowledge sharing behavior, and the items in the two constructs have been validated with field sample data. The third theoretical contribution of this study is that it provides some reasons as to why people share knowledge online. Again based on the theory of the need to belong, this study finds theoretical explanation and empirical evidence that both perceived online attachment motivation and perceived online relationship commitment motivate knowledge sharing online. These findings contribute to our understanding of the motivation to share knowledge online and add richness to explanations of the process of online learning.

Table 5
Summary of the Goodness-of-fit Indices for the Model (*N* ¼ 581).

Model	Chi-sq/df	RMR	RMSEA	GFI	AGFI	NFI	NNFI	IFI	CFI
Suggested values#	<3	<0.05	<0.1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9
Testing Results	0.34	0.033	0.061	0.95	0.92	0.96	0.96	0.97	0.97

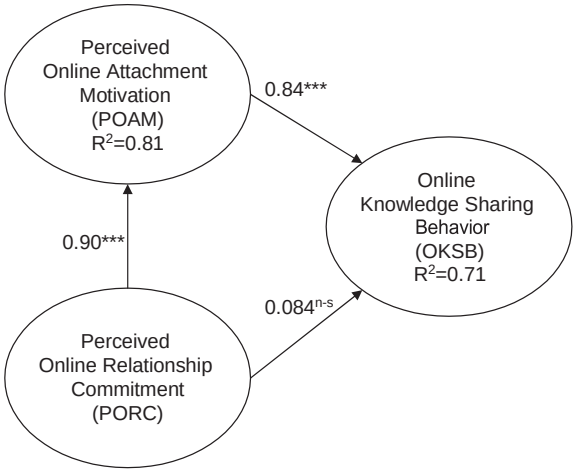

Fig. 2. Online Knowledge Sharing Model (OKSB) Testing Results.

6.3 Practical contributions

The findings of this study show that the need to belong significantly predicts knowledge sharing behavior. This indicates that the best way to promote knowledge sharing behavior online is to fulfill users' need to belong through the online teaching and learning platforms themselves. This could be achieved by designing and implementing systems and mechanisms that make the formation of online social bonds easier and enable users to easily maintain such social bonds. For example, a simple way is to provide a membership listing and to allow communications among them so that online learners can easily and freely develop and maintain relationships.

Currently, few course management systems or learning management systems have been designed to achieve these goals; rather, most are designed to facilitate the administrative needs of the instructors. Student users are managed under individual courses and are not able to form social bonds as freely as they might wish. Moreover, at the beginning of each term, all of the course platforms are renewed, which means that all existing student users are removed from the course and replaced by newly enrolled students, thus breaking any online social bonds formed by the existing students. In line with the findings of the model proposed here, other studies have suggested termlessness as a means of maintaining students' motivation to engage in online learning activities (Guzdial, Rick, & Kehoe, 2001).

6.4 Limitations and further research

Despite the usefulness of its findings, this study has several limitations. First, the generalizability of the study is constrained by its specific context of undergraduate students using an online learning environment in a local university in Hong Kong. Second, the proposed online knowledge sharing model is based only on three online constructs. To better understand the complex and complicated human processes involved in learning, future research should consider additional variables that affect the online knowledge sharing process. For example, the self-determination theory suggests that autonomy, competence, and relatedness are the three core needs determinants of relationship quality, subject well-being, and satisfaction (Patrick, Knee, Canevello, & Lonsbary, 2007; Ryan & Deci, 2000). Further, previous studies have related the need

to belong to academic engagement and performance (Anderman, 2002; Buhs, Ladd, & Herald, 2006; Furrer & Skinner, 2003), which suggests that the model proposed here could be extended to predict psychological outcomes and academic performance. Finally, the measurement of knowledge sharing in this study has its limitations. Receiving advice from peers cannot account for all the active aspects of knowledge sharing behaviors, such as giving positive feedback, offering emotional support and help, and sharing resources and ideas to maintain established relationships. Future study may develop scale to measure the wider scope of online knowledge sharing behaviors in order to reflect the various aspects of online knowledge sharing.

Table 6
Summary of the Hypothesis Testing Results (N = 581).

Causal Paths	Path Coefficients	Hypotheses
Perceived Online Attachment Motivation (POAM) / Online Knowledge Sharing Behavior (OKSB)	0.84***	H1, *supported* H2a, *not supported*
Perceived Online Relationship Commitment (PORC) / Online Knowledge Sharing Behavior (OKSB)	$0.084^{n\text{-}s}$	H2b, *supported*
Perceived Online Relationship Commitment (PORC) / Perceived Online Attachment Motivation (POAM)	0.90***	

R-square: OKSB (0.71, in reduced form); POAM (0.81).
***$p < 0.001$; (n-s): non-significant.

7. Conclusion

This study attempts to extend our understanding of the factors that influence online knowledge sharing. It has developed an online knowledge sharing model that has the fundamental need to belong as its core factor to explain online knowledge sharing behavior. The need to belong is operationalized as perceived online attachment motivation and perceived online relationship commitment. Taking a field sample of undergraduates using an online learning environment at a local university, the convergent and discriminant validity of the constructs are proven, and the empirical results show the model to have strong explanatory and predictive power. The construct of Perceived Online Attachment Motivation has a strong and direct significant effect on online knowledge sharing behavior, and Perceived Online Relationship Commitment has an indirect significant effect on online knowledge sharing behavior that is fully mediated by Perceived Online Attachment Motivation. These results provide an alternative perspective on online knowledge sharing behavior, and suggest that designing online teaching and learning platforms that facilitate the formation and maintenance of social bonds among learners is a possible means of promoting knowledge sharing online.

Appendix A. Online Knowledge Sharing Model Scale

Constructs (Sources)	Items
Perceived Online Attachment Motivation (POAM) (Hill, 1987)	1. If I feel unhappy or kind of depressed in learning (subject), I usually try to be around other members using the ILN to make me feel better. 2. I usually have the greatest need to have other

	members using the ILN around me when I feel upset in learning (subject). 3. I often have a strong need to be around other ILN users who are impressed with what I am like and what I do in (subject). 4. I mainly like to be around other ILN users who think I am an important, exciting person in learning (subject) together. 5. I often have a strong desire to get other ILN users around to notice me and appreciate what I am like in learning (subject) together.
Perceived Online Relationship Commitment (PORC)(Rusbult et al., 1998)	1. I am committed to maintaining my relationship with other members using the ILN to learn (subject). 2. I want my relationships with other members using the ILN to learn (subject) to last for a very long time. 3. I feel very strongly linked to my relationship with other members using the ILN to learn (subject). 4. I would feel very upset if my relationship with other members using the ILN to learn (subject) were to end. 5. I seek the long-term future of my relationship with other members using the ILN to learn (subject).
Online Knowledge Sharing Behavior (OKSB)Sources: (Ko et al., 2005)	1. The advice I receive from other members using the ILN has increased my understanding of (subject). 2. The advice I receive from other members using the ILN has increased my knowledge of (subject). 3. The advice I receive from other members using the ILN allows me to complete similar tasks in (subject) more efficiently. 4. The advice I receive from other members using the ILN allows me to improve the quality of similar work in (subject). 5. The advice I receive from other members using the ILN allows me to conduct similar (subject) tasks with greater independence.

* (subject) was replaced by the subject that the respondents were studying.
* ILN refers to "Interactive Learning Network."

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