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Abstract

In the digital era, social networking sites (SNSs) are widely used to support online learning and knowledge exchange (KE) in projects that require the coordination of collaborative team-playing. The use of SNSs for KE has been accelerated by the recent COVID-19 world pandemic. Paradoxically, while digital infrastructures enable instant communication, SNSs are not always conducive to KE behaviours, as learners are reticent to exchange knowledge with their peers online due to trust issues ranging from personal privacy, IPR (Intellectual property rights) protection, and peer pressure, thus leading online users to conceal knowledge. Although an increasing number of studies have explored knowledge-hiding behaviours in the physical context, its occurrence is still uncharted territory in an online setting, due to the peculiarity of the emerging virtual KE practices. Given that online-based KE practices are still in their infancy, one major weakness in current educational and knowledge management research is the lack of a reliable scale to measure knowledge-hiding online. This study develops and validates a novel Online Knowledge-hiding (OKH) scale that keeps into account the distinctive features of SNSs. While building on prior measurements of knowledge-hiding, we identify, test, and validate different indicators of the latent OKH construct. A mixed-method approach to scale development was used to validate this scale. Results show that the proposed scale is effective for organizations to assess whether online knowledge-hiding takes place during KE activities. The usefulness of this scale lies in improving the online collaborative learning environment while setting the foundation to address KE-related deviant behaviours at their incipit.

Keywords: Knowledge-hiding; Social Networking Sites; Online Collaboration; Online Learning; Knowledge Sharing; Teamwork.

1. Introduction

Knowledge sharing is an important element in both collaborative projects and learning activities. It can positively influence learners' collaborations, satisfaction, and motivation (Aparicio, Bacao, & Oliveira, 2016; Eid & Al-Jabri, 2016; Lin et al., 2016), and a large number of studies have highlighted the importance of social networking sites (SNSs) in the digital era, which can facilitate peer collaboration and knowledge sharing in an online learning setup (Anders, 2018; Chan, & Pow, 2020; Hong & Gardner, 2019; Koranteng & Wiafe, 2019).

Besides, the COVID-19 pandemic has also enhanced the role of SNSs in learning (Mulenga, & Marbán, 2020). Educational institutions have been forced to adopt online teaching and learning during the lockdown period of COVID-19. Likewise, private firms had to move their meetings online and opt for online staff training. This change in the normal conditions of training has been facilitated by novel digital technologies as they provide a way to communicate and collaborate allowing people to distance themselves from one another. While knowledge sharing is the basis of successful collaborations, paradoxically knowledge-hiding behaviours often emerge. In this regard, very little research has addressed why learners are unwilling to share what they know or even hide knowledge, especially in SNSs (Fang, 2017). Seminal studies by organizational sociologists and anthropologists identified knowledge-hiding behaviour as early as the 1960s (Mechanic, 1962; Nieburg, 1963).

Knowledge-hiding was defined as the intentional attempt of an individual to conceal knowledge that others have requested. This behaviour is a multifaceted phenomenon, and it has three main dimensions: playing dumb, evasive hiding, and rationalized hiding (Connelly et al., 2012). For example, when playing dumb, the knowledge hider simply pretends not to know the information requested a bit of information, in evasive hiding the knowledge hider misguides the interlocutor

or share incomplete information. Finally, in rationalised hiding, the knowledge hider makes an excuse or blames a third party for not sharing the requested knowledge. Although growing research has explored knowledge-hiding in companies and universities (Connelly & Zweig, 2015; Connelly et al., 2012; Ghani et al., 2019; Khalid et al., 2018; Jha & Varkkey, 2018; Zhao et al., 2016), there is a lack of evidence of how it unfolds amongst online communities.

The study of knowledge-hiding in the virtual environment can be challenging, as it bears unique features and functions when compared to the same phenomenon in a physical context. SNSs are virtual communities with varied multimedia tools (e.g., synchronous and asynchronous presentations, audio-visuals, and textual material) in which the knowledge hider can refuse to share information by using excuses related to technical failures, or by limiting his/her interaction by using ambiguous forms of communication, such as emojis. Also, knowledge sharing in virtual communities is in a textual and recorded format, because once an individual shares any information or sends a message on the online platforms that could be copied and used by other members. This situation exposes participants to the risk of information leaks that could spread without permission or knowledge of the parties involved. How does knowledge-hiding take place in SNSs? How can knowledge-hiding be identified so that collaborations can improve? Given the current gap in the extant literature this study aims to (i) explore the dimensions of online learners' knowledge-hiding behaviour in SNSs, and (ii) to develop and validate a scale to measure knowledge-hiding in SNSs learning contexts.

The paper is structured as follows: in section two we will discuss knowledge-hiding and knowledge not-sharing, knowledge-hiding in an online context, and the online knowledge-hiding scale. Section three focuses on the focus-group discussion, the pilot, and presents a major study to

validate the online knowledge-hiding scale. Section four discusses the results and presents the implications, and section five concludes the study.

2. Knowledge-hiding in a Knowledge-sharing Society: A Conceptual Framework

2.1 KE practices between Knowledge-hiding and Knowledge Not-sharing

Anecdotes have explicated that martial arts masters are well-known for not sharing their secrets with novices. The same applies to important chefs, who would add their special ingredients only when their assistants are not around. Coca-Cola is perhaps the best example of a recipe whose ingredients have been kept secret for a long time. Knowledge-hiding is not uncommon amongst humans. This inclination of human nature is found in a knowledge-sharing context. From a pedagogical point of view, it is difficult to motivate individuals to share their knowledge with others (Wittenbaum et al., 2004). To deal with this challenge, practitioners concentrated on motivating individuals towards knowledge sharing (Wasko & Faraj, 2005) using different incentives: shaping the knowledge-sharing climate, improve the sense for fairness, and overall, by keeping track of a psychological contract and its maintenance (Bartol & Srivastava, 2002; Bouty, 2002; Jarvenpaa & Staples, 2001).

Despite much exploration of the factors aiming to promote knowledge sharing, knowledge-hiding behaviours still exist in organizations. This is problematic in a society whose technological, social, and economic advancement increasingly rely on knowledge-sharing practices. Yet, knowledge-hiding is often overlooked by researchers. The reason why knowledge-hiding is rarely discussed in current organizational research may be attributed to the simplistic assumption that promoting knowledge sharing will be a solution to knowledge-hiding.

However, knowledge-hiding is dissimilar to not-sharing knowledge, as not-sharing knowledge may occur because of a lack of knowledge. On the other hand, knowledge-hiding is an intentional attempt to conceal some information and can occur in the presence of knowledge, and both may take place simultaneously (Connelly et al., 2012; Peng, 2013). For example, knowledge sharing may not take place when individuals have no knowledge to share, whereas knowledge-hiding occurs when individuals have the knowledge and intentionally conceal it from the knowledge seekers. Furthermore, the motivation that triggers these two types of behaviour are different: Knowledge-hiding may occur due to the fear of losing power, status, as well as knowledge ownership. Furthermore, the lack of knowledge sharing may occur due to the absence of knowledge with individuals, or they may not engage in knowledge sharing behaviour mistakenly and unintentionally (Connelly et al., 2012).

2.2 Knowledge-hiding in an Online KE Context

Recent research on the factors influencing knowledge-hiding (Ghani et al., 2019; Khalid et al., 2018; Zhao et al., 2016) highlighted the gravity of this phenomenon worldwide and at the same time also indicated how the engagement with an online reality exacerbated this phenomenon. However, the majority of such research occurred in an organizational physical context, and only a few studies investigated knowledge-hiding online. An exception to this is a few studies that focused on social network sites for learning and collaborations (Zhai et al., 2020), which concluded that privacy concerns amongst collaborators are at the basis of knowledge misuse thus triggering knowledge-hiding behaviours in collaborative learning.

The use of SNSs, such as LinkedIn, WeChat, and Facebook have expanded their scope from being used merely for personal communication to a multiplicity of community-based learning and knowledge-sharing activities, e.g., collective learning, remote collaborations, and digital sharing

(Lugano, 2016; Wakefield, & Frawley, 2020). SNSs applications can effectively facilitate individual or group communication (Hu et al., 2015) and some researchers argue that the use of SNSs for educational purposes is regarded as one of the main revolutions that have taken place across all educational settings (Sanchez et al., 2014). Besides, SNSs embrace the engagement of individuals in critical thinking, collaborative learning, and communication enhancement (Ajjan & Hartshorne, 2008; Lockyer & Patterson, 2008).

Despite its rising importance, the exchange of knowledge is often less satisfactory in online environments than in a physical setting, because individuals normally have a strong sense of information ownership, which leads to knowledge-hiding and hoarding (Davenport & Prusak, 1998; Zhai et al., 2020). Thus, the practice of knowledge-hiding in the context of SNSs is understandable if not justified, due to the fluidity and informality of SNSs platforms.

When compared to a physical setting (with frequent face-to-face communication), SNSs are equipped with supplementary tools which help in controlling group or interpersonal communication, such as the automatic approximation of recipients' availability (Alhddad, 2015). This suggests that an individual's behavioural response in an online context may deviate from one's behavioural response in a physical context. Moreover, individuals' behaviour is influenced by their surroundings (Bandura & Walters, 1977). An individual's behaviour (i.e., knowledge-hiding) may vary depending on its environment of interaction, for instance, whether knowledge-hiding takes place in a physical or online scenario. Given the limitations of online communication, e.g., limited non-verbal and paraverbal communication cues, individuals can behave differently by adopting different strategies to hide knowledge in the online context. Hence, a scale to measure knowledge-hiding in an online context is particularly important to improve the effectiveness of online collaboration practice.

Following the aforementioned discussion, we examine the construct of knowledge-hiding and its dimensions. We develop and validate a knowledge-hiding scale to be applied to SNSs (i.e., Online Knowledge-hiding Scale, short. OKH) to measure online learners' knowledge-hiding behaviour.

3. Online Knowledge-hiding Scale: Methodology for the Scale Development

The previously validated scale to measure knowledge-hiding in the physical context was introduced by Connelly et al. (2012). Their study identified three dimensions of knowledge-hiding: plying dump, evasive hiding, and rationalized hiding in a physical setting. Recently, also Kumar et al. (2018) investigated knowledge-hiding in the physical context and presented the theoretical underpinnings for the scale but did not validate it empirically. Despite the efforts of these studies to present a scale to measure knowledge-hiding, they neglected its measurement and the nuances of online collaboration. Thus, in this study, we explore the dimensions of knowledge-hiding and validate its scale in an online learning context.

3.1 Online Knowledge-hiding Scale Development and Validation

To develop and validate the scale we followed the three-step process proposed by Vos and colleagues (2019) and Ali et al. (2020): we examined the items and dimensions of knowledge-hiding, designed the scale, and conducted both pilot and formal validations. During the validation process, we conducted some statistical analysis to evaluate scale reliability and validity. Table 1 shows a summary of the three-step method followed in this study.

Table 1

Knowledge-hiding scale development phases

Phases	Methodology	Sample	Data Collection	Analysis	Results
Step 1: Generation of items and	Qualitative study	12 students (for items' generation)	Group discussion	Content analysis	8 dimensions comprising 48 items

evaluation of content validity		26 students and 5 experts (for content validity evaluation)	Face-to-face interview		
Step 2: Pilot study to refine the scale	Quantitative study	807 students	Face-to-face, printed questionnaire	PCA, EFA,	PCA 8 dimensions consisting of 36 items (5 items were deleted); EFA 8 dimensions consisting 31 items (2 items were deleted)
Step 3: Major study for scale validation	Quantitative study survey	541 students	Face-to-face, printed questionnaire	CFA	CFA 8 dimensions comprising 29 items

3.1.1 Generation of the Items and Scale Internal Validity (Step 1)

Items generation. Initially, a pool of 48-item was generated based on (a) a review of existing scales and contemporary research work on knowledge-hiding and (b) on the exploration of different constructs through a discussion with students using SNSs for a learning purpose during a focus-group. The main objective of the discussion run in a focus-group was to search for confirmation of knowledge-hiding behaviours as seen from the participants' perspective. This was geared towards checking for face validity and using this information to operationalize the new constructs adapted from the relevant literature.

Based on prior research (Connelly et al., 2012; Jha & Varkkey, 2018), we compiled the initial set of items. We followed the guideline for focus discussion recommended by Krueger (2002). The focus-group panel included twelve students (seven males and five females, aged 20-35) recruited from a Chinese university, enrolled in an MBA program in China, and was engaged in collaborative learning with their colleagues on an online platform. An experienced qualitative researcher was appointed as a moderator during the focus group discussion. The discussion lasted for 150 minutes. The participants were asked to recall a situation in which their friends or colleagues have asked them for information through SNSs and how they responded to such a

request. They were also asked to write the strategy used to hide information from the knowledge seeker. Lastly, the panel reflected on the initial set of items generated from previous studies and some of the new items that had emerged from the discussion.

A qualitative content analysis was performed on the focus group data and revealed eight main behaviours related to knowledge-hiding: (i) showing being too busy or occupied with something, (ii) pretending to have no clue about the topic, (iii) adopting a tactic that used graphical representations of ideas (using graphic images and emojis), which we labelled as 'ideographic tactic', (iv) diverting discussion about an uncomfortable topic, (v) withholding facts from the seeker, (vi) acting with diplomacy to deny the release of the information requested, (vii) postponing the discussion to a later date, and finally (viii) counter-questioning.

The ideographic tactic identified in the focus group emerged as a new dimension of knowledge-hiding, as it had never been mentioned in any existing study. This was inexistent before online collaborations existed or before teachers and learners had an online presence. The ideographic tactic refers to the use of social media icon features (e.g., sharing emoji, animated GIFs, stickers, and other images) to hide knowledge using an ambiguous reply. The focus group participants confirmed that an ideographic tactic can contribute to avoiding knowledge sharing the most, as by doing so they provided a quick response to the inquirer while hiding some information without severing interpersonal connections.

Scale face validity. We refined the preliminary pool of 48 items by evaluating its face validity through students' and professionals' appraisals. A group of 26 students participated in a meeting to assess the preliminary items pool and identified the redundancy and the content vagueness. The group included PhD candidates in a university in China, who are actively engaged in learning and collaboration on an online platform with their colleagues and supervisors, 12 male and 10 female

students, ages ranged from 24 to 36 years. Besides, five research experts helped to identify content ambiguity, redundancy, and construct representation. As a result of this procedure, 12 items were eliminated, leaving 36 for subsequent analysis. These items were translated from English to Chinese using a back-translation procedure (Brislin, 1980). Two Chinese professors, who are fluent in both Chinese and English languages, translated the instrument from English to Chinese. Another two bilingual professors with expertise in knowledge management translated the Chinese version into English version to verify the versions equivalence. We were satisfied that the two versions did not present embedded biases caused by the translations.

3.1.2 Pilot Study (Step 2)

We followed the initial validation by conducting a pilot study with the aim to (a) reduce the preliminary items pool to a manageable size and this was done employing principal component analysis (PCA), and (b) validate the basic structure of the data and its reliability using exploratory factor analysis (EFA).

Method and analysis. Along with the main items to test, some controls were included in the data collection. Therefore, we gathered information on demographics such as gender, age, education, as well as usage habits information such as SNS type used. By adding the controls, the final OKH scale comprised 36 items. These items were measured with a 5-point Likert scale (1= strongly disagree, 5= strongly agree).

The participants (n= 807) were all university students in Chinese universities, and they participated in the survey by completing a paper-based questionnaire. Here we followed the procedures for scale purification (Matsunaga, 2010), by splitting the dataset obtained into two random subsets: one destined for principal component analysis (PCA) (n = 403), and the other one (n = 404) to be tested with exploratory factor analysis (EFA). Using multiple samples for PCA and

EFA, it provided strong support for the identification of similar component pattern structures. By applying a Promax rotation, PCA was conducted on 36 items (n = 403). To examine whether the sample was satisfactorily for PCA, the Kaiser Meyer-Olkin (KMO=.88) test showed the adequacy of the sample size. The items were retained with primary factor loadings of at least 0.6, and the second-highest factor loadings did not cross the lower limit of 0.3 as suggested by Henson and Roberts (2006) and Matsunaga (2010). Five items were removed, and the rest of the items (31) contributed to eight different factors which altogether explained 81.05% of the total variance.

To determine the primary factors' structure, we ran exploratory factor analysis (EFA) on the retained 31 items based on the second subset of data (n = 404) by following the procedures recommended by Matsunaga (2010), with .6 and .3 as retention criteria. This led us to the further removal of another two items leaving us with a 29-item scale distributed over 8 constructs. Table 2 displays the EFA results.

Table 2
Results of EFA (29-items solution).

Dimensions	Items	Factor Loadings								CA	CR	AVE
Busy status	SO1	**.842**	.053	-.045	.038	-.027	.043	.006	-.039			
	SO2	**.934**	.010	-.015	.012	.034	-.036	-.008	.011	.944	.941	.841
	SO3	**.971**	-.026	.076	-.054	.004	.006	-.010	.010			
Pretence of ignorance	NC1	-.022	**.984**	-.009	-.020	.003	-.001	.014	.007			
	NC2	.045	**.932**	-.003	.009	.023	-.026	-.003	-.021	.975	.972	.920
	NC3	.013	**.961**	.004	.025	-.037	.015	.005	.016			
Ideographic tactic	IT1	.022	-.031	**.963**	-.004	-.064	.015	.007	-.001			
	IT2	.004	-.053	**.896**	.028	-.043	.004	.032	.021	.898	.886	.667
	IT3	-.018	.122	**.746**	-.081	.100	-.020	-.072	.112			
	IT4	.009	-.021	**.616**	.183	.038	-.001	.093	-.126			
Diverting discussion	DD1	.019	-.002	.041	**.745**	-.017	.046	.020	.012			
	DD2	-.007	.038	.003	**.888**	.013	-.005	.011	-.065	.916	.914	.727
	DD3	-.082	.000	.024	**.915**	.024	-.023	-.006	-.046			
	DD4	.076	-.024	-.024	**.852**	-.002	-.008	-.088	.135			
Facts withholding	HF1	.097	-.021	.032	.011	**.794**	-.022	-.029	-.041			
	HF2	-.061	.009	-.023	.055	**.825**	-.037	-.033	.036	.871	.869	.625
	HF3	-.023	-.022	.046	.050	**.801**	-.022	.053	.031			
	HF4	.008	.017	-.071	-.081	**.740**	.115	.048	-.030			
Diplomacy	Dip1	-.017	-.009	-.021	.075	.045	**.780**	.068	.007			
	Dip2	.022	.018	.001	.003	-.047	**.946**	.047	-.046	.895	.887	.725
	Dip3	.003	-.024	.022	-.055	.051	**.819**	-.109	.070			

										CA	CR	AVE
Discussion postponement	PD1	-.030	.040	.074	-.030	.007	.007	**.749**	-.031	.836	.848	.586
	PD2	.060	-.025	-.105	.085	-.039	-.020	**.870**	.021			
	PD3	.011	-.025	-.007	-.086	.036	-.051	**.813**	.055			
	PD4	-.068	.038	.107	-.035	.036	.067	**.604**	-.007			
Counter-questioning	CQ1	-.033	.065	-.026	.082	-.013	.034	.046	**.670**	.825	.818	.531
	CQ2	.056	-.049	-.078	.051	-.059	-.041	.120	**.779**			
	CQ3	-.035	-.013	.029	-.036	.010	.034	-.064	**.792**			
	CQ4	-.003	.007	.103	-.059	.052	.003	-.027	**.664**			

Note: N= 404, Principal Axis Factoring and Promax rotation, CA=Cronbach's Alpha, CR=Composite Reliability, AVE=Average Variance Extracted.

Results. The eight factors were labelled as busy status, pretence of ignorance, ideographic tactic, diverting discussion, facts withholding, diplomacy, discussion postponement, and counter-questioning, and altogether explained 78.82% of the total variance. The reliability of the factors measured by means of Cronbach's Alpha was above the value of 0.7 (Field, 2013) for all items, threshold considered as good. The composite reliability of all the constructs was also above the threshold value of .6 (see Table 2) (Hair et al., 2007).

Table 3
Knowledge-hiding (OKH) scale items.

Busy Status	1. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I pretend I am busy. 2. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I tell him/her I have too many things to do. 3. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I pretend to have a lot of work to sort out.
Pretence of Ignorance	4. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I pretend I know nothing about the topic. 5. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I pretend I have no clear idea about the topic. 6. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I pretend not to know what s/he is talking about.
Ideographic Tactic	7. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I share emojis, stickers and images to avoid the conversation. 8. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I share emojis, stickers and images to hide some information 9. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I share emojis, stickers and images to redirect the subject of the conversation. 10. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I share emojis, stickers and images to ignore what I am being asked.

Diverting discussion	11. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I agree to help but I also manipulate the information. 12. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I agree to help but I intended to mislead. 13. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I agree to help but I try to talk on some other day. 14. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I agree to help but I intended to share inappropriate information.
Facts Withholding	15. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I agree to help but I instead gave him/her information different from what s/he wanted. 16. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I agree to help but I instead gave him/her incomplete information. 17. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I offer some information, which is difficult for him/her to understand. 18. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I offer some part of the requested information.
Diplomacy	19. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I explain that the information is really confidential and only available to people working on a particular project. 20. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I tell him/her that my boss or supervisor really would not let me share this information with anyone. 21. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I explain that I would like to help but was not really authorized by supervisor.
Discussion Postponement	22. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I explain that I would like to help but have to discuss it in detail with my boss or supervisor to get permission to share it. 23. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I explain that I would like to help but claiming to return with more information after consulting the person concerned about the subject under discussion. 24. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I explain that I would like to help but have a meeting with my boss or supervisor. 25. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I explain that I would like to help but pretend to have issues with the internet connection.
Counter-Questioning	26. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, instead of giving response, I ask question about that topic. 27. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I ask to explain a little more. 28. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I tell him/her to give a brief introduction about the topic. 29. When I use SNS for learning and my peer/friend sends a message to discuss a topic and wants some information, I ask to share more facts.

3.1.3 Formal Study: Scale External Validity (Step 3)

The structure of the factors was validated by means of confirmatory factor analysis (CFA) and structural equation modelling (SEM) on a new dataset.

Method and analysis. Confirmatory factor analysis (CFA) was performed on a new dataset gathered from university students using online platforms for learning in China (n= 478) to validate the eight-factor model previously identified as a result of EFA. Similar to the earlier phases, students filled the paper-and-pencil survey. Table 4 shows the demographics of the respondents. IBM SPSS AMOS 24 was used to analyse the data and the criterion-related validity was assessed regarding the explanatory power of the final scale dimensions, tested through standard multiple regression (Hu & Bentler, 1999; Matsunaga, 2010).

Table 4: Sample's description.

Variable	PCA (n=403)	EFA (n=404)	CFA (n=478)
Age (in years)			
<25	42.2	37.2	37.0
26-30	44.2	40.8	43.5
>32	13.6	22.0	19.5
Gender			
Male	43.7	49.0	47.9
Female	56.3	51.0	52.1
Education			
Graduates	56.1	61.4	59.3
Under-graduates	34.9	38.6	40.7
Social Network Site Used			
WeChat	68.0	60.2	63.4
QQ	26.6	33.9	32.8
Other	5.4	5.9	3.8

Common method bias. A common method bias (CMB) was evaluated via following approaches suggested by Podsakoff et al. (2003). First, we applied a Harman single-factor test. The findings indicate that one factor explained 31.69% of the total variance which is less than the criterion value of 50% (Harman, 1976). Hence, the CMB was not an issue in this study. Second, CMB issue exists when the inter-correlations values among the study variables are higher than .90 (Pavlou, & El Sawy, 2006). The correlation results indicate that the higher inter-correlations were not found

higher than .90 among the study variables. These statistics indicated that a common method bias was not a severe issue in the data.

Results. The sample differences were checked before running CFA (See Table 4). Results of the chi-square test show no significant difference regarding gender and age of the respondents.

IBM SPSS AMOS 24 was used to evaluate the model according to a multi-criteria strategy recommended by Hu and Bentler (1999). The eight-factor model was validated as the indices i.e., $\chi2df=708.663/349 =2.031$, $p < .001$), GFI=.907, CFI=.963, SRMR=.043, NFI=.931, and RMSEA=.046 indicates an acceptable model fit because all the indices' values are above the threshold values (Hu & Bentler, 1999).

Table 5
Confirmatory factor analysis.

Constructs	Items	Factor Loadings	Cronbach's α	CR	AVE	MSV	ASV
	SO1	.894					
Busy status	SO2	.790	.895	.896	.743	.396	.115
	SO3	.898					
	NC1	.948					
Pretence of ignorance	NC2	.931	.950	.951	.866	.396	.109
	NC3	.912					
	IT1	.890					
Ideographic tactic	IT2	.909	.900	.905	.705	.240	.164
	IT3	.832					
	IT4	.714					
	DD1	.831					
Diverting discussion	DD2	.847	.901	.902	.696	.240	.138
	DD3	.840					
	DD4	.820					
	HF1	.775					
Facts withholding	HF2	.800	.861	.863	.613	.229	.112
	HF3	.847					
	HF4	.703					
	Dip1	.872					
Diplomacy	Dip2	.923	.879	.884	.719	.223	.144
	Dip3	.739					
	PD1	.799					
Discussion postponement	PD2	.888	.882	.884	.658	.259	.103
	PD3	.846					
	PD4	.700					
	CQ1	.813					
Counter-questioning	CQ2	.854	.873	.875	.636	.259	.089

| | CQ3 | .798 |
| | CQ4 | .720 |

Note: CR=Composite Reliability, AVE=Average Variance Extracted, MSV=Maximum Shared Variance, and ASV=Average Shared Variance.

Table 5 indicates that convergent validity and discriminant validity criteria of the model (Campbell & Fiske, 1959) have been met. Three tests demonstrate the convergent validity: first, the factor loadings are significant (at $p<.001$) ranged from .700 to .948; second the composite reliability value exceeds the threshold of .70 as suggested by Helms et al. (2006), and third the values of average variance extracted are also above the criterion value of .50 recommended by Bagozzi and Yi (1988). Similarly, discriminant validity is sufficient, evaluated by three tests: first, Table 6 shows that factor correlations were under the threshold value of .85 suggested by Kline (2005); and second, Table 5 shows that maximum shared variance and average shared variance are less than average variance extracted (Farrell & Rudd, 2009; Hair et al., 2007). Third, the square root of AVE of each construct is greater than all the correlations with other variables (Fornell and Locker, 1981). Moreover, the internal consistency of all the factors is sufficient (see Table 5). The Cronbach's alphas values of all the factors exceed the threshold of .70 recommended by Field (2013).

Table 6 shows the correlations among the eight factors. The findings exhibit that all the factors are closely related to each other. However, the correlation coefficient was high between busy status and pretence of ignorance (r=.629). Therefore, we used variance inflation factor (VIF) to check the multi-collinearity among these factors (Mason & Perreault, 1991). The VIF values ranged from 1.432 to 1.797, which are less than 10, confirming no issue of multicollinearity (see Table 7).

Table 6
Correlations' matrix.

	1	2	3	4	5	6	7	8
1. Busy status	(.862)							
2. Pretence of ignorance	.629**	(.931)						

	1	2	3	4	5	6	7	8
3. Ideographic tactic	.406**	.411**	(.840)					
4.Diverting discussion	.297**	.251**	.490**	(.834)				
5.Facts withholding	.220**	.246**	.479**	.459**	(.783)			
6.Diplomacy	.207**	.169**	.472**	.399**	.452**	(.848)		
7.Discussion postponement	.164**	.127**	.262**	.331**	.135**	.471**	(.811)	
8.Counter-questioning	.189**	.169**	.238**	.308**	.114*	.363**	.509**	(.800)

Note: **. P<0.01, *p<.05, The value in the parenthesis is the square root of AVE.

The criterion-related validity of the model was also found to be sufficient (Table 7). The analysis revealed that the eight dimensions of the OKH had a significant effect on the overall knowledge-hiding ($p < .001$).

Table 7
Regression results

Dimensions	Knowledge-hiding				
	Standardized β	Unstandardized β	S.E.	*P*	VIF
Busy status	.178	.104	.003	***	1.756
Pretence of ignorance	.173	.100	.003	***	1.758
Ideographic tactic	.195	.134	.003	***	1.797
Diverting discussion	.227	.144	.003	***	1.581
Facts withholding	.201	.141	.003	***	1.577
Diplomacy	.164	.101	.003	***	1.756
Discussion postponement	.216	.137	.003	***	1.592
Counter-questioning	.212	.138	.003	***	1.432

4. Discussion of the Results and Implications

Extant studies have only measured knowledge-hiding in the physical context (Connoly et al., 2012; Jha & Varkkey, 2018), hence, it was imperative to develop a scale for the online context. It is important to be able to measure knowledge-hiding in an online environment because a majority of people are seeking and communicating knowledge daily through online sites (Eid, & Al-Jabri, 2016; Kim, Lee, & Oh, 2020; Prestridge, 2019). Many employees are asked to work from home while collaborating with their colleagues via different online platforms during the COVID-19 global pandemic. Results from the focus groups discussion and the two independent samples supported the validity of the measures whose development we elucidated in this study. The findings of the study exhibited and validated eight dimensions of knowledge-hiding: busy status, pretence of ignorance, ideographic tactic, diverting discussion, facts withholding, diplomacy, discussion postponement, and counter-questioning. There are several implications related to the development of an OHK scale.

4.1 Theoretical Implications

This study offers the following theoretical contributions to the literature on knowledge-hiding

in knowledge management and education studies. First, to the best of our knowledge, this is the

very first study to validate a scale of knowledge-hiding in an online learning and collaboration context. It extended the application of the knowledge-hiding scale traditionally used for in a face-to-face context into the measurement of knowledge-hiding in SNSs. Second, this study validated firstly the eight-dimensional construct of knowledge-hiding typical of an online context i.e., busy status, pretence of ignorance, ideographic tactic, diverting discussion, facts withholding, diplomacy, discussion postponement, and counter-questioning.

The emergence of an ideographic tactic to knowledge-hiding is a novel behaviour that has not been observed before either in face-to-face or online collaboration and online learning contexts. This tactic, which uses SNSs icon-like features, offers a new tool to hide knowledge. By making use of ideographic tactics, the person who tries to hide some knowledge from a third party avoids or ignores the original question of the knowledge seeker by sharing some icons (e.g., GIFs, stickers, emoji, etc.) and at the same time does not harm the interpersonal relationship with the knowledge seeker.

Participants regarded the ideographic tactic as a tool that provides a quick and socially acceptable response to the request for information without releasing the information. One participant stated that 'when I received the request to share information that I didn't want to share, I sent a smiley emoji to the inquirer. It turned out that the emoji got the requestor confused and he stopped asking further questions. Finally, this study complements and extends the research work of Connelly et al. (2012) and Jha and Varkkey (2018), who developed a scale for knowledge-hiding for face-to-face physical learning environment.

4.2 Practical Implications

Practically, this research contributes to a more profound understanding of knowledge-hiding in practice in online learning and collaborative environments that focus on KE activities. The

implications for learning institutions and organizations are that practitioners could use this scale to assess and measure knowledge-hiding, to be able to formulate policies to overcome the occurrence of different types of knowledge-hiding behaviours. For example, organizations might adopt a systematic mechanism to discourage knowledge-hiding by incentivizing knowledge sharing (e.g., through monetary rewards to the knowledge sharer) to build an environment based on reciprocal trust where knowledge could be shared without fear or hesitation. Furthermore, having trust in the learning environment is very important for knowledge exchange as more and more learners are staying at home and using online platforms for learning due to COVID-19 lockdown. Educational institutions, e.g., online learning institutions or groups where learners experience various types of hiding behaviours, might need to rely on the identification of the antecedents to overcome the occurrence of knowledge-hiding.

To practitioners, the developed scale can be useful to facilitate the assessment of and knowledge-hiding magnitude to fight it. Thus, the scale could help them devise interventions to minimize one or more aspects (i.e., busy status, pretence of ignorance, ideographic tactic, diverting discussion, facts withholding, diplomacy, discussion postponement, counter-questioning) of knowledge-hiding. Finally, given an improved understanding of the knowledge-hiding behaviour and strategies, instructors could enhance trust amongst learners (Hsu et al., 2007) in SNSs by acknowledging the members for sharing information while minimizing their concerns about information misuse. Instructors could therefore be active agents that shape the knowledge-sharing environment by providing opportunities for learners to socialize, to build trust, to encourage knowledge-sharing, and by developing a knowledge-sharing culture in collaborative online environments.

5. Conclusions

The purpose of this study was to develop and validate the online knowledge-hiding (OKH) scale. Our findings support OKH as a scale suitable to measure knowledge-hiding in an online context. Theoretically, this scale extends the scope of knowledge-hiding to an online context, with a particular focus on SNS. Additionally, our study provides an integrated view of knowledge-hiding that can enhance organisations' and practitioners' awareness of knowledge-hiding behaviours, so to facilitate their assessment of knowledge-hiding in their organisations and its potential impact on individuals and organisational collaboration outcomes.

With the help of our findings, effective knowledge-hiding avoidance strategies can be developed to tackle knowledge-hiding. Doing so will contribute to building and sustaining an environment with lower knowledge-hiding while enhancing knowledge sharing in the workplace.

Notwithstanding our study's contributions to a better understanding of knowledge-hiding, it also presents some limitations. First, this study is conducted in one online community and one country only. It was difficult for us to collect data from different countries due to the financial costs involved, the accessibility to relevant samples, and the time frame of our study. In future studies, diversifying the participants' pool could contribute to improving generalisability beyond the current population.

The second limitation of our study relies on cross-sectional data. Since online technological advancements are fast-paced and obsolescence is a real threat to studies on online practices, perhaps future studies could use longitudinal data to further test the robustness of this scale in an ever-changing online environment.

Finally, the sample consisted of university students only. Although students' online collaboration dynamics share many similarities with online collaboration dynamics in a workplace,

making students an ideal population to test the scale's validity and reliability, future research may

take a sample of those employees who are working online, to test for changing magnitudes in the

applicability and generalisability of the current scale.

References

Ali, Z., Ghani, U., Islam, Z. U., & Mehreen, A. (2020). Measuring career shocks: A study of scale development and validation in the Chinese context. *Australian Journal of Career Development, 29*(3), 164-172.

Ajjan, H., & Hartshorne, R. (2008). Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *The Internet and Higher Education, 11*(2), 71-80.

Alhddad, L. (2015). Read receipts feature in mobile platform: An investigation study based on social tie between the sender and receiver. Thesis. Rochester Institute of Technology. Retrieved on January 8, 2017 from http://scholarworks.rit.edu/theses/8946.

Anders, A. D. (2018). Networked learning with professionals boosts students' self-efficacy for social networking and professional development. *Computers & Education, 127*, 13-29.

Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-learning theoretical framework. Educational Technology and Society, 19(1), 292-307.

Bandura, A., & Walters, R. H. (1977). Social learning theory (Vol. 1). Englewood Cliffs, NJ: Prentice-hall.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74-94.

Bartol, K., & Srivastava, A. (2002). Encouraging knowledge sharing: The role of organizational reward systems. *Journal of Leadership and Organization Studies, 9*(1), 64–76.

Bouty, I. (2002). Interpersonal and interaction influences on informal resource exchanges between R&D researchers across organizational boundaries. *Academy of Management Journal, 43*, 50–65.

Brislin, R. W. (1980). Translation and content analysis of oral and written materials. *Methodology*, 389-444.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multifruit-multimethod matrix. *Psychological Bulletin, 56*(2), 81-105.

Chan, J. W. W., & Pow, J. W. C. (2020). The role of social annotation in facilitating collaborative inquiry-based learning. Computers & Education, https://doi.org/10.1016/j.compedu.2019.103787.

Connelly, C. E., & Zweig, D. (2015). How perpetrators and targets construe knowledge-hiding in organizations. *European Journal of Work and Organizational Psychology, 24*(3), 479-489.

Connelly, C. E., Zweig, D., Webster, J., & Trougakos, J. P. (2012). Knowledge-hiding in organizations. *Journal of Organizational Behavior, 33*(1), 64-88.

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

Eid, M. I., & Al-Jabri, I. M. (2016). Social networking, knowledge sharing, and student learning: The case of university students. *Computers & Education, 99*, 14-27.

Fang, Y.-H. (2017). Coping with fear and guilt using mobile social networking applications: Knowledge-hiding, loafing, and sharing. *Telematics and Informatics, 34*(5), 779-797.

Farrell, A. M., & Rudd, J. M. (2009). Factor analysis and discriminant validity: A brief review of some practical issues. Anzmac.

Field, A. (2013). Discovering statistics using IBM SPSS statistics: sage.

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research, 18,* 382-388.

Ghani, U., Zhai, X., Spector, J. M., Chen, N.-S., Lin, L., Ding, D., & Usman, M. (2019). Knowledge-hiding in higher education: role of interactional justice and professional commitment. *Higher Education.* https://doi.org/10.1007/s10734-019-00412-5

Hair, J. F., Black, B., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2007). Multivariate Data Analysis. 6th ed., Pearson Education, New Delhi.

Harman, H. H. (1976). *Modern factor analysis*. University of Chicago press: Chicago, IL, USA,

Helms, J. E., Henze, K. T., Sass, T. L., & Mifsud, V. A. (2006). Treating Cronbach's alpha reliability coefficients as data in counselling research. *The Counseling Psychologist, 34*(5), 630-660.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological Measurement, 66*(3), 393-416.

Hong, Y., & Gardner, L. (2019). Undergraduates' perception and engagement in Facebook learning groups. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.12672

Hsu, M. H., Ju, T. L., Yen, C. H., & Chang, C. M. (2007). Knowledge sharing behaviour in virtual communities: The relationship between trust, self-efficacy, and outcome expectations. *International Journal of Human-Computer Studies, 65*(2), 153-169.

Hu, L. t., & Bentler, P. M. (1999). Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1-55.

Hu, X., Chu, T.H., Leung, V.C., Ngai, E.C.H., Kruchten, P., Chan, H.C., (2015). A survey on mobile social networks: applications, platforms, system architectures, and future research directions. IEEE Communication. *Surveys. & Tutorials 17* (3), 1557–1581.

Jarvenpaa, S. L., & Staples, D. S. (2001). Exploring perceptions of organizational ownership of information and expertise. *Journal of Management Information Systems, 18*, 151–183.

Khalid, M., Bashir, S., Khan, A. K., & Abbas, N. (2018). When and how abusive supervision leads to knowledge-hiding behaviours: An Islamic work ethics perspective. *Leadership & Organization Development Journal, 39*(6), 794-806.

 Kim, H., Lee, J., & Oh, S. E. (2020). Individual characteristics influencing the sharing of knowledge on social networking services: online identity, self-efficacy, and knowledge sharing intentions. *Behaviour & Information Technology, 39*(4), 379-390.

Kline, R. B. (2005). Principles and practice of structural equation modelling 2nd Ed. New York: Guilford.

Koranteng, F. N., & Wiafe, I. (2019). Factors that promote knowledge sharing on academic social networking sites: An empirical study. *Education and Information Technologies, 24*(2), 1211-1236.

Krueger, R. A. (2002). Designing and conducting focus group interviews. Retrieved January 6, 2012 from http://www.comm.umn.edu/akoerner/courses/5431-S10/Krueger-Focus GroupInterviews.pdf

Jha, J. K., & Varkkey, B. (2018). Are you a cistern or a channel? Exploring factors triggering knowledge-hiding behaviour at the workplace: evidence from the Indian R&D professionals. *Journal of Knowledge Management, 22*(4), 824-849.

Lockyer, L., & Patterson, J. (2008). Integrating social networking technologies in education: A case study of a formal learning environment. In Eighth IEEE international conference on. Paper presented at the Advanced Learning Technologies, 2008. ICALT'08.

Lin, L., Mills, L. A., & Ifenthaler, D. (2016). Collaboration, multi-tasking and problem-solving performance in shared virtual spaces. *Journal of Computing in Higher Education, 28*(3), 344-357.

Lugano, G., 2016. Mobile social networking. In: Kurylo, A., Dumova, T. (Eds.), Social Networking: Redefining Communication in the Digital Age. Fairleigh Dickinson University Press, Lanham.

Mason, C. H., & Perreault, W. D., Jr. (1991). Collinearity, power, and interpretation of multiple regression analysis. *Journal of Marketing Research, 28*(3), 268–280.

Matsunaga, M. (2010). How to Factor-Analyze Your Data Right: Do's, Don'ts, and How-To's. *International Journal of Psychological Research, 3(*1), 97-110.

Mechanic, D. (1962). Sources of power of lower participants in complex organizations. *Administrative Science Quarterly, 7*(3), 349-364.

Mulenga, E. M., & Marbán, J. M. (2020). Is COVID-19 the Gateway for Digital Learning in Mathematics Education?. *Contemporary Educational Technology, 12*(2), ep269.

Nieburg, H. (1963). Uses of violence. *Journal of Conflict Resolution, 7*(1), 43-54.

Pavlou, P. A., & El Sawy, O. A. (2006). From IT leveraging competence to competitive advantage in turbulent environments: The case of new product development. *Information Systems Research, 17*(3), 198-227.

Peng, H. (2013). Why and when do people hide knowledge? *Journal of Knowledge Management, 17*(3), 398-415.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioural research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903.

Prestridge, S. (2019). Categorising teachers' use of social media for their professional learning: A self-generating professional learning paradigm. *Computers & Education, 129*, 143-158.

Sanchez, R. A., Cortijo, V., & Javed, U. (2014). Students' perceptions of Facebook for academic purposes. *Computers & Education, 70*, 138-149.

Vos, M. C., Galetzka, M., Mobach, M. P., van Hagen, M., & Pruyn, A. T. (2019). Measuring perceived cleanliness in service environments: Scale development and validation. *International Journal of Hospitality Management, 83*, 11-18.

Wakefield, J., & Frawley, J. K. (2020). How does students' general academic achievement moderate the implications of social networking on specific levels of learning performance?. *Computers & Education,* https://doi.org/10.1016/j.compedu.2019.103694.

Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS quarterly*, *29*(1), 35-57.

Wittenbaum, G. M., Hollingshead, A. B., & Botero, I. C. (2004). From cooperative to motivated information sharing in groups: Moving beyond the hidden profile paradigm. *Communication Monographs, 71*, 286–310.

Zhai, X., Wang, M., & Ghani, U. (2020). The SOR (Stimulus-Organism-Response) paradigm in the online learning context: An empirical study of students' knowledge-hiding perceptions. *Interactive Learning Environments, 28*(5), 586-601.

Zhao, H., Xia, Q., He, P., Sheard, G., & Wan, P. (2016). Workplace ostracism and knowledge-hiding in service organizations. *International Journal of Hospitality Management, 59*, 84-94.