Education and Information Technologies (2019) 24:1699–1714
https://doi.org/10.1007/s10639-018-09854-3

Exploring the role of Facebook adoption and virtual environment loneliness on knowledge sharing behaviors in a Facebook learning community

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Received: 3 September 2018 / Accepted: 17 December 2018 / Published online: 4 January 2019

Abstract
Current research aimed to investigate the structural relationships among knowledge sharing behavior, adoption of Facebook and virtual loneliness behavior. The dataset of this study were gathered from Knowledge Sharing Behaviors (KSB) Scale, Facebook Adoption (FA) Scale and Virtual Environment Loneliness (VEL) Scale. Structural equation modelling was used to test the research hypotheses. The structural relationships among KSB, FA and VEL of the virtual community members were examined. It was found that there were moderate and significant relationships in a positive direction among KSB, FA and VEL. The structural model indicated that the increase in the FA and decrease in the VEL levels of the community members improved KSB as well. It was seen that the highest factor load value in KSB scale originated from FA scale. Today, Facebook is one of the most popular social networking sites (SNS) to create virtual communities. In addition, the impact of adoption of Facebook by community members and the feeling of virtual loneliness arising as a result of using Facebook were examined.

Keywords Social networking · Knowledge sharing behaviors · Virtual environment loneliness · Facebook adoption · Virtual learning community

1 Introduction

Today, with the spread of the use of Web 2.0 technologies, traditional communities of practice moved to virtual environments and the ways community members share knowledge changed. Knowledge sharing among the members of communities of practice has started to be carried out through virtual communities via asynchronous

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communication and interactions (Mora et al. 2014). With the recent improvements in internet, the concept of knowledge sharing has gone beyond organizational and physical community contexts and became a social, global and virtual context for virtual communities (Zhao 2010). In addition to offering an open environment for knowledge sharing not limited by time and location, the advance knowledge sharing and communication features of these environments have increased the prevalent use of virtual communities. Although there are many platforms to create virtual environments, social networking sites (SNS) are preferred more often.

Zhao (2010) indicates that since the social construction of knowledge on virtual communities is made based on discussions and social interactions, it is more suitable to use knowledge sharing instead of information sharing for the sharings that community members make in the community. Therefore, the term "knowledge sharing" is used in the current study. When the studies are reviewed, it is seen that information technologies and knowledge management systems have a significant role in ensuring knowledge sharing (Alavi and Leidner 2001; Zhao 2010). In his study, Leung (2011) states that teenagers spend a lot of time to upload photos, videos and personal information on such popular web sites as Facebook and YouTube to show their identity. The increasing use of Facebook and its advanced communication and knowledge sharing features turns it into a leading environment in creating virtual communities of practice (Zhang et al. 2015). In particular, such features of Facebook as creating groups, adding-removing-blocking members, organizing security features, tagging, creating socio-emotional expressions and viewing discussion history offer a convenient environment in terms of creating virtual communities of practice. In addition, teachers have started to think that this environment could be easily used in education with the feeling of acceptance and adoption that the prevalent use of Facebook has brought along (Fauville et al. 2015). In their study on the use of SNS as a tool in education, Sanchez-Casado et al. (2016) found that Facebook was more often preferred compared to other platforms. This access points out that Facebook is adopted by the students and offers educators an occasion to give information to the students through an application that students already know about (Irwin et al. 2012). When the studies are examined, it is seen that SNS ties could have an effect on knowledge sharing (Chen et al. 2009; Ma and Chan 2014). Also, as Fang and Chiu (2010) indicate in addition to being an important component for virtual communities of practice, knowledge sharing can be an effective reason for motivation. In the scope of the research Wang and Noe (2010), it was indicated that the effect of using SNS on KSB was a topic that should be studied. In addition, the studies indicate that one of the aims of virtual communities is to encourage the knowledge sharing among the individuals in order to provide that the knowledge on the network is well-understood (Chen et al. 2009).

In addition, the literature indicates that individual differences and psycho-social variables could have an impact on KSB (Błachnio et al. 2016; Ryan and Xenos 2011). In Wang and Noe's (2010) study on KSB, another factor was the impact of individual differences and psycho-social variables on KSB. Encouraging individuals to share knowledge and increasing their motivation towards KSB in virtual learning communities, where knowledge sharing is essential, are important issues in this process. Adoption of Facebook, which is one of the tools used to create virtual learning communities frequently used for efficient learning environments today, could be considered as one of the individual differences related to KSB. In this respect, how

the use of Facebook effects individuals' KSB in creating virtual learning communities is one of topics in question. Apart from that, it is supposed that the use of Facebook as a learning community will ease social inclusion such as interaction and cooperation among the members of the community and thus, will reduce the feeling of virtual loneliness. In this respect, how the feeling of virtual loneliness among Facebook-based virtual learning community members will effect KSB is another topic examined in this study. Within the scope of this study, the impact of the VEL feeling as a psycho-social variable on KSB was examined. When the studies are examined, whilst some of the researhers state that using internet and SNS could cause to loneliness (Yao and Zhong 2014); others indicate that individuals with a feeling of loneliness could show higher interest in internet and SNS (McKenna et al. 2002). This is an uncertainty related to the effect of the use of SNS on loneliness. In terms of identifying how KSB, a major dynamic of SNS-based virtual learning communities effect the feeling of loneliness is a topic that requires further research. People could also engage in KSB in virtual communities with an effort to make themselves visible and to express themselves to the members of the community in this manner. When the researches looking into KSB in virtual communities are investigated, it is revealed that the adoption of the virtual community and the structural relationship with the virtual environment loneliness have not been examined but it is stated that these variables are important variables to be examined according to the literature. The aim of current study, which was carried out based on the above given hypotheses, was to find out the predictive power of FA and VEL on KSB. It is supposed that the results from this research will guide instructional designers and practitioners to create and manage virtual learning communities.

2 Review of the literature and hypotheses

2.1 Knowledge sharing behaviors

Construction of knowledge occurs when students are given the occasion to interact with other students and to discuss and share what they know (Redmond and Lock 2006). Knowledge sharing, on the other hand, happens when one spreads what s/he learned with the other members of the community (Ryu et al. 2003). Learning in virtual communities continues through observations of the individuals, this case could be explained by social constructivism. Social constructivism claims that learning in the communities could be through the interaction among the students (Yilmaz et al. 2017). According to social constructivism, even if a community member does not attend in knowledge sharing process directly, s/he could learn through observations, discussions and interactions. Bock and Kim (2002) claim that one's purpose to share knowledge is related to actual knowledge sharing of that individual in a positive direction, and this relationship is modulated by the use of information technologies for knowledge sharing. Sometimes, obstacles are encountered in the KSB process in virtual communities. Researchers indicate that technology-based systems could be used in order to prevent such obstacles and make the KSB of the community members easier and thus, individuals could interact over these systems. It is also given that as these environments are informally created, the knowledge sharing in these environments will make knowledge sharing among the community members easier (Ardichvili et al. 2003).

According to Wang and Noe's (2010) study on knowledge sharing, five main factors (organizational context, interpersonal and team characteristics, cultural characteristics, individual characteristics and motivational factors), are efficient on KSB. When Wang and Noe's (2010) research has been examined, it is revealed that there is a need for studies on SNS and individual characteristics. In her study Kim (2009) states that there are some major factors effecting KSB of the individuals. Accordingly, researchers indicate that the behaviors in social interaction environments are mostly voluntary behaviors and that the KSB of the community members should be determined considering the impact of the individual, cognitive and social factors. The need for new research in explaining the reasons behind individuals' KSB supports that there is a need to carry out this study.

As sharing knowledge could lead to the formation of new knowledge and to innovations, researchers indicate that motivating students to share knowledge is one a topic to be studied (Hung et al. 2011). Davenport and Prusak (1998) state knowledge sharing between community members is a process which involves the transfer of knowledge from a sender, completion of the transfer and successfully giving meaning to this knowledge by the receiver. Defining what supports/does not support the KSB of the community members and what increases/does not increase the knowledge sharing in this process of giving meaning are important in terms of designing and management of effective virtual communities. When the literature is examined, it is revealed that research towards identifying the factors effecting this process is necessary. Besides, Ardichvili et al. (2003) indicate that when individuals are given tasks individually, the motivation to share knowledge falls. And it is indicated that SNS, which offer group interaction and collaboration could support knowledge sharing in overcoming this problem (Paroutis and Al Saleh 2009). And it is expected that this will help reducing the feeling of virtual loneliness which is seen as an obstacle against KSB, and thus, facilitate the development of KSB. In this scope, how the feeling of loneliness of the individuals in virtual communities created via Facebook effect knowledge sharing process was examined. Examining the social variables in virtual learning communities with a holistic view is expected to contribute to increasing, constructing and developing the use of virtual learning communities.

2.2 The relationship among knowledge sharing behaviors and Facebook adoption

Online virtual communities open a new and efficient way for knowledge sharing at social and global levels in the new era (Zhao 2010). In the literature, it is indicated that there are many interactions among individuals who did not have social connections to online social communities before (Butler et al. 2002). In addition, the studies carried out indicate that online learning environments which provide opportunities to establish social connections enable students to show high-level KSB and thus, to get better learning outcomes (Ma and Yuen 2011). With the growth of social media services, knowledge management technologies are expanded to include Web 2.0 tools (including Wikis, chat systems, profiles and tagging) and these technologies encourage users in virtual communities to express their ideas and to share these ideas with other users (Doring 2015). Researchers indicate that developing group identity, increasing the frequency of the interactions among group members and developing communication will ensure knowledge sharing (Cabrera and Cabrera 2002; Kane et al. 2005).

When people share knowledge, they should have a benefit from this sharing, the platform where they share should be easy to use and should be used by the people they consider important, they should get immediate support when they face a problem and they should have a feeling of belonging to this community. In addition, in their study Kane et al. (2005) state that shared social identity is an important factor supporting knowledge transfer. According to a model developed by Mazman and Usluel (2010), the main factors in the adoption of Facebook are usefulness, ease of use, social influence, facilitating conditions and community identity. Usefulness is defined as the probability that performance will enhance using the new (Davis 1989). In their study, Wang et al. (2012) define that Facebook is a useful platform for knowledge and resource sharing. Accordingly, it is supposed that the perception of usefulness will effect KSB. Ease of use is related to the degree of phsyical and mental effort that is necessary to use a certain system (Davis 1989). Since students are familiar with the use of Facebook, they will be able to use it with minimum physical and mental effort. And this, in turn, will improve students' perception of ease of use. Venkatesh et al. (2003) define social influence as "the degree to which an individual perceives that important others believe he or she should use the new system". The fact that educators, role models for students, are using Facebook frequently today will increase the social influence towards using this environment. Facilitating conditions are defined as one's belief towards the existence of the organizational and technical structure to use a system (Venkatesh et al. 2003). Such features as technical support, help etc. that Facebook offers for the users could lead to higher facilitating conditions beliefs. Community identity is a concept that is based on the participation behaviors of the individuals in a community, their social interactions and social relationships in such communities (Rink and Ellemers 2007). According to this, high community identity beliefs of the students in Facebook group created within the scope of current study will improve their participation behaviors, social interactions and relationships. Adoption of Facebook as a virtual learning community is supposed to improve KSB of the students. Accordingly, the first hypothesis of the study related to KSB and sub-hypotheses are as given below:

H1: Adoption of Facebook would positively affect KSB.
H1a: Usefulness of Facebook would positively affect KSB.
H1b: Ease of use of Facebook would positively affect KSB.
H1c: Social influence of Facebook would positively affect KSB.
H1d: Facilitating conditions of Facebook would positively affect KSB.
H1e: Community identity of Facebook would positively affect KSB.

2.3 The relationship among knowledge sharing behaviors and virtual environment loneliness

Loneliness represents a subjectively perceived lack of satisfying social relationships (Peplau, 1988, cited in Martončik and Lokša 2016). Online environment and the social interaction in it are appealing for the individuals who feel lonely (Leung 2011); and these environments have the potential to meet the needs of belonging for those individuals. Usta et al. (2014) define VEL as the incoherence within existing and

desired social relationships in the virtual environments. According to the structure put forth by Usta et al. (2014), VEL involves three dimensions, which are virtual socialization, virtual sharing and virtual loneliness. Sheldon (2008) found that socially anxious people used Facebook to reduce their feeling of loneliness. As for Ryan and Xenos (2011) lonely people tend to spend more time on Facebook daily. When these results are considered from an education environment perspective, it is possible that there could be students who are anxious about interacting with others and have a feeling of loneliness. The use of Facebook virtual learning communities could offer a solution to this case. In fact, Lou et al. (2012) state that the teachers and administrative staff at school could provide academic and emotional support for students outside the classroom using SNS. Thus, students could interact with others through Facebook learning community and their feeling of loneliness could be reduced. And it is supposed that this could effect the KSB of the students. In their studies on freshman, researchers studied the relationship among the feeling of loneliness and Facebook intensity and motive for using Facebook. They found that Facebook intensity had a positive influence on the feeling of loneliness (Lou et al. 2012). It is supposed that the feeling of loneliness of the individuals in virtual environment could have an effect on their KSB in virtual application communities. Accordingly, the second hypothesis of the study and its sub-hypotheses are given as below:

H2: Low VEL would positively affect KSB.
H2a: Virtual socialization would positively affect KSB.
H2b: Virtual sharing would positively affect KSB.
H2c: Low Virtual loneliness would positively affect KSB.

3 Methods and procedures

Current implementation was a correlational study. Correlational design allows to explore the relationships among dependent and independent variables (Creswell 2013).

3.1 Participants

Data were collected in fall semester of 2015–2016 academic year. Participants were 279 students who use Facebook-based knowledge sharing community in Computing I course for sharing knowledge. Of all the participants, 138 were female (49.5%) and 141 were male (50.5%). When Facebook using experience of the participants was examined, it was seen that 43 of the participants had an experience of less than one year (15.4%), 32 of them had an experience of 2–3 years (11.5%), 81 of them had an experience of 4–5 years (29.0%) and 123 had an experience of more than 5 years (44.1%).

3.2 Instruments

3.2.1 Personal information form

Personal information form was generated by the researcher. Demographic information such as gender, department and Facebook using experience were asked in this form.

3.2.2 KSB scale

KSB Scale is a five-point likert scale developed by Alakurt (2013). It has four sub-scales (being happy to help, respect, usefulness/compliance, trust and sacrifice) with 21-items. Responses regarding KSB vary between strongly disagree(1) and strongly agree(5). Internal consistency of the sub-scales was found between .67 and .84. The internal consistency of the scale was .84.

3.2.3 FA scale

FA Scale is a ten-point likert scale developed by Mazman (2009). It has five sub-scales (usefulness, ease of use, social influence, facilitating conditions, community identity) with 22 items. Responses regarding FA vary between strongly disagree(1) and strongly agree(5). Internal consistency of the sub-scales was found between .84 and .90. The internal consistency of the scale was .91.

3.2.4 VEL scale

The VEL Scale is a five-point likert scale generated by Korkmaz et al. (2014). It has three sub-scales (virtual socialization, virtual sharing and virtual loneliness) with 20 items. Responses regarding VEL vary between strongly disagree(1) and strongly agree(5). Internal consistency of the sub-scales was found between .61 and .84. The The internal consistency of the scale was .91.

3.3 Data collection

Respondents were students who used Facebook group in Computing I course. Researchers found that long-term positive relationships in the community helped to develop KSB among the participants (Chow and Chan 2008). Therefore, the current study continued throughout one semester. In the group they shared knowledge about the contents of the course (e.g. what they didn't understand clearly, depth of the content, need for help in technical problems). And the students were asked to attend to questionnaire and who agree to participate, given a link. Within the scope of the study, the scales were sent to those students, who were members of the virtual learning community, online. Only volunteering students were asked to participate and going forward without answering a question was prevented. As a result, data were gathered from 279 students and the analyses were made using these data.

3.4 Data analysis

Appropriateness of the dataset for structural equation modeling (SEM) was investigated using the normality value, sample size, linearity and multiple linearity hypotheses with SPSS 17.0. Skewness and Kurtosis tests were within ranged between −1 and + 1, normality assumptions retained. Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity tests were run to explore appropriateness of the dataset. KMO values were calculated as .76 for KSB, .78 for FA and .64 for VEL. Because of this value is greater than .60 and

Bartlett test was significant (chi-square = 1835.932, $p < .05$), it was decided that the dataset were appropriate for analysis (Hair et al. 2006).

Multiple correlation analysis was used for investigating the relations among the structures. Further statistical analysis methods as descriptive analysis and SEM were run. SEM, which was made to present the structure in the study, was made through LISREL 8.80. As for Peprah (2000) in models with high fit indexes, the programs used for this purpose in examining the structural relationships provided similar results. Therefore, LISREL 8.80 was preferred for SEM analysis in current implementation. Evaluating the appropriateness of the model, chi-square (x^2) goodness of fit test, RMSEA, NFI, NNFI, CFI, GFI and AGFI were used.

4 Findings

4.1 Students' responses to KSB, FA and VEL

Results of the descriptive statistics KSB, FA and VEL are provided in Table 1.

As it is presented in Table 1, the students'average KSB scale score was 77.43 (3.69 over 5) whilst their average from the FA scale was 149.31 (6.79 over 10) and their average score from VEL scale was 61.69 (3.25 over 5). In terms of these results, it is possible to say that students' knowledge sharing behaviors scale scores could be considered as high; whilst their FA and VEL scale scores could be considered as moderate.

Table 1 Descriptive statistics

Scales	Number of items	Minimum score	Maximum score	$\overline{X}$	sd	$\overline{X}$/k
Knowledge Sharing Behaviors Scale	21	49.00	105.00	77.43	12.22	3.69
Usefulness/compliance	4	8.00	20.00	14.91	3.01	3.73
Sacrifice	3	4.00	15.00	9.59	2.54	3.20
Respect	4	8.00	20.00	15.03	3.18	3.76
Be happy to help	7	15.00	35.00	26.74	4.84	3.82
Trust	3	6.00	15.00	11.16	2.34	3.72
Facebook Adoption Scale	22	62.00	220.00	149.31	37.20	6.79
Usefulness	4	8.00	40.00	25.39	8.00	6.35
Ease of use	4	11.00	40.00	30.32	8.90	7.58
Social influence	4	4.00	40.00	23.53	8.74	5.88
Facilitating conditions	7	20.00	70.00	50.57	13.70	7.22
Community identity	3	5.00	30.00	19.52	6.35	6.51
Virtual Environment Loneliness Scale	20	44.00	81.00	61.90	7.08	3.10
Virtual Socialization	8	16.00	38.00	26.58	4.61	3.32
Virtual Sharing	7	7.00	32.00	19.09	5.86	2.73
Virtual Loneliness	5	7.00	25.00	16.23	4.29	3.25

When the KSB sub-scales' averages were examined, it was revealed that the average scores of the students under usefulness/compliance, respect, being happy to help and trust were high whilst their average score under sacrifice was moderate. And in the FA scale's sub-scales, students' scores in ease of use and facilitating conditions were high whilst their averages under usefulness, social influence and community identity sub-scales were moderate. In VEL scale's sub-scales students' averages were moderate in virtual socialization, virtual sharing and virtual loneliness.

4.2 Relations among students' KSB, FA and VEL

In order to identify the relationships among KSB, FA and VEL (Table 2), the Pearson correlation coefficients were measured.

When Table 2 is reviewed, it is revealed that there is a moderate correlation among KSB and FA ($r = .41$, $p < .01$); and among KSB and VEL scores ($r = .34$, $p < .01$). And in terms of sub-scales, it is revealed that there is a moderate level of correlation among the total scores from KSB scale and usefulness ($r = .40$, $p < .01$), ease of use ($r = .32$, $p < .01$), facilitating conditions ($r = .39$, $p < .01$) and community identity ($r = .36$, $p < .01$) sub-scales of FA scale. It is also revealed that there is a low level of correlation among the total scores from KSB scale and social influence ($r = .19$, $p < .01$) dimension. It is seen that there is a moderate and significant correlation among the total score from KSB scale and virtual socialization ($r = .42$, $p < .01$) sub-scale of VEL scale; and an insignificant low level of correlation among virtual sharing ($r = .04$, $p > .05$) and virtual loneliness ($r = .06$, $p > .05$).

4.3 Results of path analysis

In this stage, to investigate the relationships between the latent variables, SEM analysis was run. SEM results are provided in Fig. 1. SEM results show X^2/df of 2.07, a GFI of .98, an AGFI of .91, a RMSEA of .063, a SRMR of .016, a NFI of .99, a NNFI of .98 and a CFI of .99. In the current implementation, the proposed model show a perfect fitness. Model fit indices are provided in Table 3.

When the model which was shown in Fig. 1 is analyzed, it is revealed that the most significant variable on KSB is the FA. Regression coefficient was $\beta = .36$ ($R^2 = .17$). It was also revealed that among the constituents of FA, the one with the highest factor load was facilitating conditions variable. And it was followed by social influence, usefulness, ease of use and community identity, respectively. It was seen that the most significant latent variable after FA was VEL. Regression coefficient was $\beta = .19$ ($R^2 = .11$). It was also seen that among the constituents of VEL, the one with the highest factor load was virtual sharing. And it was followed by virtual socialization and virtual loneliness variables.

Table 5 is presented current implementation hypotheses based on the results of the analyses. Findings show that all the hypotheses of the current implementation are acceptable.

Table 4 is presented the indirect and direct effects of the variables, it is seen in Table 5 that all the hypotheses are supported.

Table 2 Correlations among variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	r	1															
2	r	.78**	1														
3	r	.58**	.40**	1													
4	r	.76**	.45**	.21**	1												
5	r	.89**	.64**	.43**	.55**	1											
6	r	.73**	.42**	.25**	.68**	.53**	1										
7	r	.41**	.35**	.25**	.26**	.39**	.25**	1									
8	r	.40**	.38**	.26**	.23**	.39**	.18**	.82**	1								
9	r	.32**	.26**	.03	.26**	.34**	.23**	.84**	.63**	1							
10	r	.19**	.19**	.33**	.03	.13*	.08	.63**	.40**	.27**	1						
11	r	.39**	.32**	.11	.30**	.38**	.28**	.93**	.70**	.85**	.41**	1					
12	r	.36**	.25**	.40**	.18**	.33**	.21**	.78**	.60**	.51**	.54**	.62**	1				
13	r	.34**	.31**	.36**	.17**	.28**	.16**	.36**	.43**	.27**	.17**	.28**	.37**	1			
14	r	.42**	.38**	.23**	.29**	.40**	.24**	.50**	.50**	.48**	.12	.51**	.39**	.77**	1		
15	r	.04	.05	.34**	−.13*	−.02	−.03	.02	.07	−.12	.19**	−.13*	.18**	.49**	.06	1	
16	r	.06	.04	−.12	.15*	.06	.04	.04	.06	.08	−.10	.10	−.06	.16**	.11	−.63**	1

1: KSB (total). 2: KSB (Usefulness/compliance). 3: KSB (Sacrifice). 4: KSB (Respect). 5: KSB (Be happy to help). 6: KSB (Trust). 7: FA (total). 8: FA (Usefulness). 9: FA (Ease of use). 10: FA (Social influence). 11: FA (Facilitating conditions). 12: FA (Community identity). 13: VEL (total). 14: VEL (Virtual Socialization). 15: VEL (Virtual Sharing). 16: VEL (Virtual Loneliness)

**Correlation is significant at the .01 level (2-tailed)

**p < .01, *$p < .05$

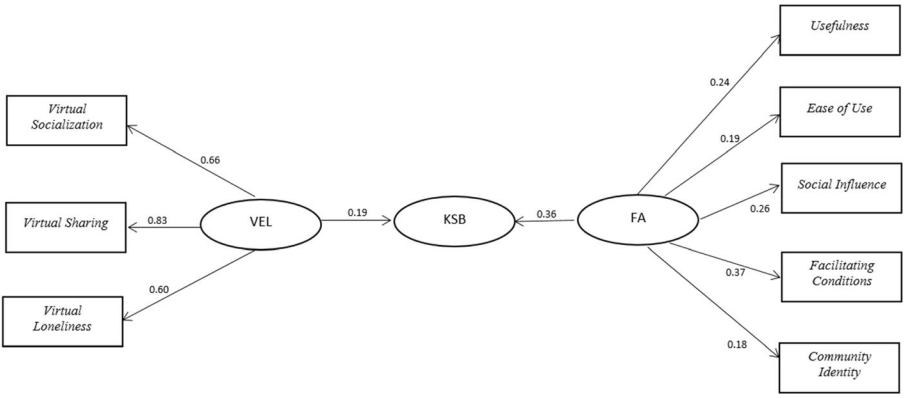

Fig. 1 The hypothetical model of structural relations among FA, VEL and KSB

5 Conclusion and suggestions

In the current study, the structural relationships among the KSB, FA and VEL of the virtual community members were explored. It was found that the KSB of the participating students was high; whilst their FA and VEL levels were moderate. It was found that there were moderate and significant relationships in a positive direction among KSB, FA and VEL structures. The structural model indicated that the FA increased and VEL of the community members would improve KSB as well. It was seen that the highest factor load value on KSB originated from FA.

In the findings related to the second hypothesis of the research, it was revealed that the variable with the highest factor load between the FA components, which had an impact on KSB, was Facilitating conditions. Facilitating conditions variable was followed by Social influence, Usefulness, Ease of use and Community identity variables, respectively. According to the model, the increase of Facilitating conditions in the virtual community would increase KSB. Based on this information, it is supposed that the ease of the use in knowledge sharing and instant support when faced with a problem are important factors in sharing. In general, it is revealed that although the indirect effects are low, FA as a latent variable has an impact. Accordingly, it can be concluded that depending on the increase in the adoption of Facebook as a virtual

Table 3 Model fit indices

Fit Index	Acceptable	Model Value (standard)	Resource
x^2 / df	$0 \leq x^2 / df \leq 3$	2.07	Kline (2005), Sumer (2000)
RMSEA	$0 \leq RMSEA \leq .08$	.063	Hooper et al. (2008)
SRMR	$0 \leq SRMR \leq .08$	.016	Brown (2006)
NFI	$.90 \leq NFI \leq 1.00$	.99	Thompson (2004)
NNFI	$.90 \leq NNFI \leq 1.00$	.98	Hair et al. (2006)
CFI	$.90 \leq CFI \leq 1.00$	.99	Tabachnick and Fidell (2007)
GFI	$.90 \leq GFI \leq 1.00$	.98	Hair et al. (2006)
AGFI	$.80 \leq AGFI \leq 1.00$	.91	Marsh et al. (1988)

Table 4 Indirect and direct standardized effects

Antecedents	Direct	Indirect	Total
FA → KSB	.36	–	.36
Usefulness → KSB	–	.09	.09
Ease of use → KSB	–	.07	.07
Social influence → KSB	–	.10	.10
Facilitating conditions → KSB	–	.13	.13
Community identity → KSB	–	.06	.06
VEL → KSB	.19	–	.19
Virtual Socialization → KSB	–	.12	.12
Virtual Sharing → KSB	–	.16	.16
Virtual Loneliness → KSB	–	.11	.11

community by the students, their participation to knowledge sharing processes and the KSB in this environment will also improve. According to Ma and Yuen (2011) social interaction and knowledge sharing are key to a successful learning environment (Ma and Yuen 2011). Accordingly, Facebook communities could be used to ensure interaction and knowledge sharing in traditional classroom environments. In fact, as for Yang et al. (2011) facebook-based virtual learning communities could be created to strengthen the instruction and learning process which expand the learning process from traditional classrooms. And above all, first of all, it is necessary to ease Facebook adoption process among the students. And to do that, Facebook-based virtual learning communities should be created in different classes and thus, students adaptation to the process should be made easier. In the studies carried out, it is indicated that the perception of usefulness and ease of use are important variables in the acceptance of the new (Abdullah and Ward 2016; Davis et al. 1989). Hence, for developing knowledge sharing in virtual communities, it is important to improve the usefulness perception for the virtual community. Accordingly, the teacher should encourage members of the community to share things that are meaningful and that provide contribution, and should

Table 5 Hypotheses results

Hypothesis		Supported?
H1	FA → KSB	Yes
H1.a	Usefulness → KSB	Yes
H1.b	Ease of use → KSB	Yes
H1.c	Social influence → KSB	Yes
H1.d	Facilitating conditions → KSB	Yes
H1.e	Community identity → KSB	Yes
H2	VEL → KSB	Yes
H2.a	Virtual Socialization → KSB	Yes
H2.b	Virtual Sharing → KSB	Yes
H2.c	Virtual Loneliness → KSB	Yes

give feedback on what members share (Salter and Conneely 2015). In addition, preferring virtual environments with simple and practical interface will contribute to the KSB.

In the findings related to the second hypothesis of the research, it was revealed that the variable with the highest factor load between the VEL components, which had an impact on KSB, was Virtual Sharing. It was followed by Virtual Socialization and Virtual Loneliness variables, respectively. In the light of this finding, it can be concluded that people's feeling of low loneliness in the virtual community improve their KSB. Weiss (1973) states that loneliness and human social support shows an inverse relationship. Loneliness is defined as the lack of social contacts. In addition, the results of this implementation indicate that those who feel less lonely in the virtual environment engage in more KSB. It is supposed that this is due to the fact that those who have less feeling of loneliness spared more time for communication and interaction with others on virtual communities and thus, they showed higher interest in knowledge sharing on virtual communities. The responsibility of the educator here is to attract the attention of the individuals to the community and to involve them in interaction and communication processes. To do that, the teacher could make some organizations such as creating small collaborative discussion groups and structure the discussions. In fact, the results of Salter and Conneely's (2015) study indicate that structured discussion environments are more successful in ensuring students' participation and engagement compared to unstructured discussions. It is claimed that the increase in loneliness and fall in the social connections could be related to high use of Internet (Dittmann 2003; Yao and Zhong 2014). Considering the fact related to the internet use of the individuals who have a feeling of loneliness, it can be said that sharing things that could attract their attention on virtual communities, organizing the content accordingly and distributing tasks in the group discussion process could effect their participation to knowledge sharing.

5.1 Limitations and future research

There are a number of limitations in this research that are worthy of further examination. First of all, the data in the current research were collected quantitatively and were limited to the answers students gave to the scales. In future research, in-depth opinions of the students can be examined. Another limitation of the research was the study group, on who the research was administered. The data in the research were gathered from a certain virtual community. In future research, data from virtual communities, created for different purposes, could be collected and KSB of these groups could be compared based on the reason the groups are created. In addition, students' study approaches could be determined, the impact of their approach on KSB could be examined. Thus, what kind of strategies students with an in-depth and shallow approach use could be discussed. In addition to that, factors related to KSB can be examined by carrying out modelling studies towards a comparative analysis of the KSB of the individuals with high and low virtual loneliness feeling and those with high and low Facebook adoption. In current implementation, Facebook was used as the virtual learning environment. In further researches, such environments as Instagram, Linkedin, Myspace and Twitter could be used for comparative analysis and their impact on KSB can be examined. The current study was carried out with university students in Turkish culture. As FA and VEL could be considered as individual difference, they could differ from one culture to another. Therefore, in future studies, the KSB of virtual communities involving people from different cultures could be examined.

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