Association for Information Systems
AIS Electronic Library (AISeL)

PACIS 2018 Proceedings

Pacific Asia Conference on Information Systems (PACIS)

6-26-2018

The More You Give the More You Get Back: Moderating Effect of Leadership on Knowledge Sharing in Online Programming Communities

Abdulrazak F. Shahatha Al-Mashhadani
Universiti Utara Malaysia, qazakian@gmail.com

Rahayu Ahmad
Universiti Utara Malaysia, rahayu@uum.edu.my

The more you give the more you get back: Moderating Effect of Leadership towards Knowledge Sharing in Online Programming Communities

Completed Research Paper

Abdulrazak F.Shahatha Al-Mashhadani [1]
School of Computing,
Universiti Utara Malaysia
06010, Sintok, Kedah, Malaysia
qazakian@gmail.com

Rahayu Ahmad [2]
School of Computing,
Universiti Utara Malaysia
06010, Sintok, Kedah, Malaysia
rahayu@uum.edu.my

Abstract

Although there is a significant growth of emerging online programming communities, little succeeded in encouraging members to contribute and share their knowledge. The role of leadership to address the under contribution problem is gaining attention among researchers. This study grounded on path-goal theory to Investigates specifically the role of supportive leadership and achievement oriented leadership behaviour toward knowledge sharing in online programming community (OPC). This introduced model is tested empirically using data collected from 20 online programming communities. The findings from the analysis suggests that self-efficacy and outcome expectancy influences knowledge sharing behaviour of members in online programming community. The finding implied that although online communities are informal in nature, the appropriate type of leadership can boost the members' efficacy and outcome expectancy toward sharing their knowledge, with the suitable level of autonomy and recognition of members contributions can motivate members to continuously contribute to online programming communities and promoting the sustainability in this platform.

Keywords: Knowledge sharing, virtual leadership, online programming communities (OPC), path goal theory, and social cognitive theory.

Introduction

The contribution of members' are very important for ensuring the survival of online communities. Despite the significant increasing numbers of emerging online communities demonstrated by previous studies, few of them succeeded in retaining and motivating their members to share knowledge. This issue lead to a serious problem of under contribution and inactivity after extended period is even pronounced in active online communities (Abouzahra & Tan, 2014; Lai & Chen, 2014). For instance, Lakhani and Von Hippel (2003) found only 4% of members contribute 50% of the answers on Apache field support system communities. Mockus, Fielding, and Herbsleb (2002) found that merely a small portion of (4%) developers contributed 88% of new code and 66% of code fixes in open source software development communities. These contributors are clearly valuable, but irregular participation will pose some risks to the online programming communities that lead to a few voices dominating the community and will affect the resource availability and the health of online communities and leave the group vulnerable until it ultimately dies if these few active contributors depart (Wang & Lantzy, 2011). These problems have trigger researchers to examine the role of leadership in motivating active contributions. Johnson, Safadi, and Faraj (2015) and

Faraj, Kudaravalli, and Wasko (2015) claimed that online community leadership processes and how leaders emerge are not well studied and there is a limited research examining the role of leaders in an online setting compared to traditional organizations. Addressing to this call, this study aims to examine the moderating role of leadership in influencing individual's efficacy and outcome expectancy towards knowledge sharing in online communities.

Literature review

Online communities and knowledge sharing

Online programming communities can be defined as a place where wide group of programmers with regular interest in programming and development skills interact and share great amounts of resources with each other via the Internet (Schwartz & Timbolschi-Preoteasa, 2015). This online programming communities bring together thousands of people from across geographical boundary and different time zone.

Knowledge sharing is the main constituent component of online programming community. It is the capability to spread an idea or concept or shape a topic discussion on programming and development. Continuous knowledge sharing helps in development of skills required by converting tacit knowledge into explicit knowledge (Al-Husseini, 2014). Online community also serves as knowledge repositories for members to gain knowledge and find answers and solution to their enquiry and problems in their fields and other aspect related to their careers.

Many studies made by previous researchers to examine the factors that affect knowledge sharing in online communities after realizing the problems faced. This factors can be categorized into several group. First is motivation. Factors that found to be significant such as reciprocity, altruism, personal gain, perceived online relationship commitment and perceived online attachment motivation, achievement motive and online social ties (Huffaker & Lai, 2007; Limpisook, 2009; Ma & Yuen, 2010; Suh & Shin, 2010). While, factors that found significant in cultural factors are fairness, identification and openness (Ardichvili, Maurer, Li, Wentling, & Stuedemann, 2006; Li, 2009; Li, Ardichvili, Maurer, Wentling, & Stuedemann, 2007). And lastly is the attitude, factors that found significant are self-efficacy and performance expectancy, Perceived enjoyment, individual attitudes towards knowledge sharing and certain personal outcome expectation, satisfaction, reciprocity, social capital, content value, social value and intention (Chang, Hsu, Liao, & Lin, 2013; Huang, Ting, & Chou, 2014; Papadopoulos, Stamati, & Nopparuch, 2013; Sheng & Hartono, 2015; Tseng & Kuo, 2014).

Despite the rapid growth and rich diversity of the online community, little is known on how they are structured and how they can sustain themselves in a leaderless organization that are often categorized by fluid boundaries, high turnover, expertise-based authority, and emergent roles (Faraj, Jarvenpaa, & Majchrzak, 2011). Because of this fluidity, leadership is important to guide the knowledge sharing process. Leadership role can engage and shape how people discuss by stimulating communication on a particular phenomenon or topic. This study takes the lead in examining the dual leadership role in moderating members' efficacy and outcome expectancy towards knowledge sharing.

Leadership

According to Bradshaw, Chebbi, and Oztel (2015), leadership plays an important role in promoting knowledge sharing activities by maintaining active participation and encouraging members to stay and continuously share their knowledge and experience with others. It is also supported by Hew and Hara (2007) who argued leadership as one of the moderating factor that aided knowledge sharing. The leader or moderator have an important role as a sieve or filter that helps keep communication focused on issues related to the community objectives. Issues unrelated to the community are kept out by the effort of the moderator or leader. Virtual leaders also act as a "watchdog" of netiquette that helps keep communication

civil. For example, unprofessional statements are frowned upon by the leader/moderator (e.g. personal attack on a member).

There are some fundamental similarities between online communities and traditional leadership. In both settings, leadership plays an important role in strengthening the community/organization and assist members/employees in building and managing relationships and resources. However, they have differential emphasis on behaviors such as monitoring behaviors, influence processes, rewards and punishments, attitudes of sharing knowledge, delegating tasks and outcomes relevant to online communities (Avolio, 2016) that need to be further investigated.

Virtual leadership is also a unique phenomenon. It does not fit neatly into any of Weber's models (Avolio, 2016). It also does not represent traditional forms, in which they inherit a position of power, nor do they represent legal authority, in which they are appointed or elected (Avolio, 2016). Although these leaders informally emerge, but they exert influence on the attitudes and behavior in online spaces they inhabit. Thus, what makes someone a leader online remains an open research question (Johnson et al., 2015; von Krogh, Nonaka, & Rechsteiner, 2012; Yoo & Alavi, 2004). According to Faraj et al. (2015), "Leaders in different type of online community's platform such as Wikipedia, Blogs, SNSs, or massively open online games or courses may have different leadership style" (p. 407).

This study is made on 20 different online programming communities. Supportive leadership and achievement oriented leadership behavior that derived from path-goal theory are examined, assuming with this type of leadership behavior, members are more keen to contribute, if they have a supportive leaders that can inspire them towards sharing knowledge in online community. Since supporting behavior is used to encourage the spirit of coordination among members (Cacioppe, 2000). It is also important factors to influence members for content contribution (Molly McLure Wasko & Faraj, 2005). In addition, adding leaders behavior that can guide leaders to build an achievement oriented environment will create an internal and external value for followers that will encourage them to contribute in reaching the goal and achieving the target as well as expanding the empire of online programming community.

Conceptual framework

To examine the role of leadership in online programming community, this study refers to path-goal theory. Path–goal theory is designed to explain how leaders can help followers along the path to their goals by

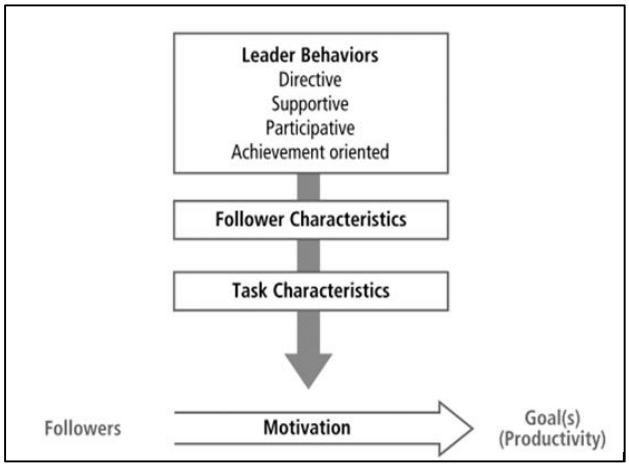

Figure 1: Summary of the Major Components of Path-Goal Theory

selecting specific behaviors that are best suited to followers' needs and to the situation in which followers are working. By choosing the appropriate style, leaders increase followers' expectations for success and satisfaction (Northouse, 2016).

Figure 1 illustrates the different components of path–goal theory, including leader behaviors, follower characteristics and task characteristics. Path–goal theory suggests that each type of leader behavior has a different kind of impact on followers'. Whether a particular leader behavior is motivating to followers is contingent on the followers' characteristics and the characteristics of the task. In this study, supportive leadership and achievement-oriented leadership behavior is selected to study the moderation effect of these leadership behavior to respectively moderates personal self-efficacy and outcome expectancy of the followers (members of online programming community) and task of programming contents and knowledge shared by the members of the online programming community. For this particular paper only two (2) leadership behavior discussed, the remaining behaviors are discussed in F.Shahatha and Ahmad (2018).

The personal characteristics that influence members (followers) of online community are adopted from social cognitive theory (SCT) namely Self-efficacy (SE) and Outcome expectancy (OE). The influence of these two factors on knowledge sharing will be moderated by these two types of leadership behavior. These leadership behavior of a leader is important in online programming community because it is assumed to boost the motivation of the followers to participate in knowledge sharing.

The following are the justification and suggestion of the hypothesis following the conceptual framework in figure 2:

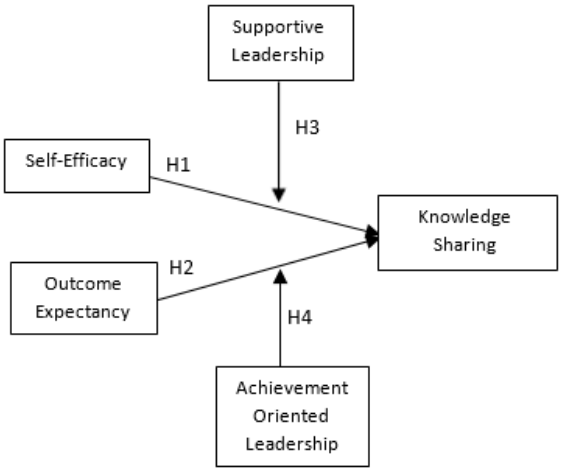

Figure 2: Conceptual Framework

Self efficacy and Knowledge Sharing

Bandura (1986) defined self-efficacy as the people's perception about what they can do with the skills they possess. Regarded as an intrinsic benefit, self-efficacy is an essential motivator of knowledge-sharing behavior, especially in an online context (Liao, To, & Hsu, 2013). Self-efficacy is enhanced when individuals feel confident about themselves to contribute their valuable knowledge to the community. Researchers have reported the positive relationship between self-efficacy and knowledge sharing (Liao et al., 2013; Zhang et al., 2017). Therefore, we assume that individuals with higher self-efficacy will contribute more and share their knowledge in online programming community. Thus,

H1: Self-efficacy has a positive effect on knowledge sharing.

Outcome Expectancy and Knowledge Sharing

Outcome expectancy is an individual's belief that carrying out a certain action will lead to a desired outcome (Bandura, 1986). This study argues that outcome expectancy positively affects a given individual's knowledge sharing. Here, outcome expectancy is defined as the consequence of an act and not the act itself. Previous studies shows that if employees believe they can improve relationships with other employees by offering knowledge, they will be more willing to share what they know with others (Chiu, Hsu, & Wang, 2006; Dong et al., 2016; Molly McLure Wasko & Faraj, 2005).

The willingness of members to share their knowledge can happen if they perceive their own knowledge needs and goals (Van den Hooff & de Leeuw van Weenen, 2004), or if they expect reciprocal knowledge sharing from coworkers (Bock, Zmud, Kim, & Lee, 2005). An increasing number of studies have shown that the more positive the expected outcomes of a specific behaviour, the more a person likely to engage in that behaviour (Chiu et al., 2006; Hsu, Ju, Yen, & Chang, 2007).

In this study, outcome expectations refer to the judgement of a members on outcome they perceived in joining online programming community that triggers them to contribute and share knowledge with other members. Therefore, this study proposes that outcome expectancy affect the knowledge sharing behavior, and proposes the following hypothesis:

H2. Outcome expectancy has a positive effect on knowledge sharing behavior.

Supportive Leadership as Moderator

In online communities, the main characteristic of the members are voluntary behavior. Therefore, it is hard to drive members to share their knowledge without strong motivation (Ipe, 2003). Supportive leadership works on moderating the relationship between self-efficacy and knowledge sharing. A virtual leader can serve to persuade members and empower their efficacy on their self-capability to contribute to the community vision by sharing their knowledge (Kirkpatrick & Locke, 1996; Yukl, 1999).

Moreover, supportive leadership can enhance self-efficacy as well. By inspiring individuals with their passion, supportive leaders underpin individuals' willingness and ability to work on improving the status quo. The more supports received by the leader, the more the member get confidence of himself to contribute to the online programming community. Moreover, through supportive leadership, members will have a stronger bond with the leaders and better understand the vision and able to anticipate the outcome of the online programming community. Therefore, we assume that individuals in the online community supported by the leader will have a high level of self-efficacy toward sharing their knowledge in the online programming community. That is to say,

H3: Supportive leadership behavior positively moderates the effect of self-efficacy on knowledge sharing.

Achievement Oriented Leadership as Moderator

Achievement-oriented leadership is characterized by a leader who challenges followers to perform work at the highest level possible. This leader establishes a high standard of excellence for followers and seeks continuous improvement. In addition to expecting a lot from followers, achievement-oriented leaders show a high degree of confidence that followers are capable of establishing and accomplishing challenging goals (Northouse, 2015).

Achievement-oriented cultures might also shed some light on the direction of knowledge flows within the online programming community as well as the assignment of specific roles within the communities for followers. According to Ardichvili, Maurer, Li, Wentling, and Stuedemann (2006), In offline organization,

achievement-oriented cultures such as in USA, status is derived from past achievements or how others relate to his or her position in the community. That is, the way in which one becomes a full member of the community, is usually the result of members earning their status in the community through a history of achievements and contribution (Hildreth, Kimble, & Wright, 2000).

Achievement oriented leadership is important in online programming communities since it can boost the motivation of the followers to attain specific goals that lead to external and internal reward. externally such as status in online programming community, for example an indicator of gaining higher position (i.e beginner, intermediate, advanced, top contributor and expert) or gaining more stars and followers. This can be seen exist in many type of online communities such as in Linux and gaming communities (Ducheneaut, Moore, & Nickell, 2007), in addition to a better set of skills gained to use for career, new network of good team to work with and so on. Internally, achievement also can be perceived by followers through successfully accomplishing a challenging task, expand knowledge and network and successfully guiding others to accomplishing task. Hence, achievement oriented environment build by leadership in online programming community will create value internally and externally for followers and will motivate them to contribute to reach goals and achieve online programming community target as well expanding the community empire. Therefore,

H4: Achievement oriented leadership behavior of virtual leader positively moderates the effect of outcome expectancy on knowledge sharing.

Research Methodology

Target Population and Sampling Design

Target population for the study is online programming communities. The respondent of online programming community were selected from top 20 programming languages listed in the TIOBE (The Coding Standard Company) that gives statistics on popularity and position of the programming languages for the first twenty programming languages from August 2016 and August 2017. Basically members of these online programming communities engage in similar tasks like 1. Ask for solution related to code 2. Fix bugs 3. Engage people to participate on creating software project 4. Share project created and ask for suggestion 4. Share expertise with other OPC members.

This study used purposive sampling which is one of the most cost-effective and time-effective sampling methods available. Invitation threads are posted on the online programming community lounge. Three hundred twenty two useful responses were obtained. Respondents were briefed about the scope of the research and how their honest responses could be useful in assessing the phenomena and were assured of confidentiality. All respondents were entered in a prize draw for $10 x 6 Amazon gift card. Data processing and analysis was performed by using the SmartPLS 3.0 with IBM SPSS Statistics version 21.

Questionnaire Design

The online survey questionnaire items are adapted from several sources (Chiu et al., 2006; Compeau, Higgins, & Huff, 1999; Davenport & Prusak, 1998; Kankanhalli, Tan, & Wei, 2005; Y. Wang & Fesenmaier, 2003). Bipolar scale from 1 to 5 will be used whereby 1 = Strongly Disagree and 5 = Strongly Agree.

Table 1: Examples of questionnaire items

Examples of questions for "self-efficacy toward knowledge sharing" are:	
1)	I am confident in responding to other members post in this Online Programming Community
2)	The knowledge I share with members in this Online Programming Community should be useful to them.

Examples of questions for "Outcome Expectation toward knowledge sharing" are:	
1)	My knowledge sharing will strengthen the tie between me and other members in this Online Programming Community.
2)	Sharing my knowledge can enhance my reputation in this Online Programming Community.
Examples of questions for "Supportive Leadership behavior" are:	
1)	The most influential members of this Online Programming Community encourage me when I needed support .
2)	The most influential members give positive feedback when I contribute to this Online Programming Community.
Examples of questions for "Achievement Oriented Leadership behavior" are:	
1)	The most influential members made me aware that participation in this Online Programming Community is beneficial and rewarding
2)	The most influential members encourage my continual contribution in this Online Programming Community.

Demographic Profiles of Respondents

85% of the respondents were male. 71.6% are from the age of 13-40 years old. The statistics also shows almost half of the participants hold bachelor degree. In terms of experience in using OPC, 43.4% of the respondent have joined between 1 to 3 years. In terms of the role in online programming communities, 29% regarded themselves as beginner level, 38% as intermediate level and the rest categorized into advanced level, expert level and moderator/community manager level. Majority members of 26% post more than once a month in OPC, followed by rarely posting in OPC with 22% members, 17.4% post more than once a week and the rest post more than once a year. In terms of frequency of visiting, 36% of OPC members visit the community everyday and 41.6% visit OPC more than once a week.

Analyses and Results

Reliability results of testing measurement model are shown in Table 2. The results indicate that the measures are robust in terms of their internal consistency reliabilities as indexed by their composite reliabilities. The composite reliabilities of different measures in the model range from 0.82 to 1.00, which exceeds the recommended threshold value of 0.70 (Nunnally & Bernstein, 1978). The average variance extracted (AVE) for each measure exceeds 0.50, consistent with recommendation of (Fornell & Larcker, 1981). Table 2 also shows the test results regarding discriminant validity of the measure scales. The bolded elements in the matrix diagonals, representing the square roots of the AVEs, are greater in all cases than the off-diagonal elements in their corresponding row and column. This result supports the discriminant validity of the scales.

Table 2: Reliability Assessment of the Measurement Model

	AVE	Composite Reliability	R Square	Cronbachs Alpha	Fornell-Larcker Criterion						
					AOL	**KS**	**M-AOL**	**M-SB**	**OE**	**SE**	**SB**
AOL	0.68	0.863	0.0000	0.777	**0.825**						
KS	0.521	0.86	0.431	0.799	0.296	**0.722**					
M-AOL	1	1	0.0000	1	0.075	0.153	**1**				

M-SB	1	1	0.0000	1	0.178	0.132	**0.136**	**1**			
OE	0.545	0.827	0.0000	0.722	0.445	0.411	0.056	**0.203**	**0.738**		
SE	0.578	0.871	0.0000	0.816	0.115	0.578	0.154	0.074	0.294	**0.76**	
SB	0.67	0.89	0.0000	0.837	0.595	0.278	0.036	0.277	0.498	0.116	**0.819**

Note: (**AOL**: Achievement Oriented Leadership, **KS**: Knowledge Sharing, **M-AOL**: Moderator-Achievement Oriented Leadersip, **M-SB**: Moderator-Supportive Leadership **OE**: Outcome Expectancy, **PB**: Supportive Behavior **SE**: Self efficacy).

Some recent criticism of the Fornell and Larcker (1981) criteria suggests they do not reliably detect lack of discriminant validity in common research situations (Henseler, Ringle, & Sarstedt, 2015). Henseler et al. have suggested an alternative approach, based on the multitrait-multimethod matrix, to assess discriminant validity: the heterotrait-monotrait (HTMT) ratio of correlations (Henseler et al., 2015). Discriminant validity was tested using this new method, and results are shown in Table 3. For the first criterion, if the HTMT value is greater than HTMT.85 value of 0.85 (Kline, 2011), then discriminant validity is a problem of. As shown in Table 3, however, all values surpassed HTMT.85.

Table 3: Heterotrait-monotrait (HTMT).

	AOL	KS	M-AOL	M-SB	OE	SE	SB
AOL							
KS	0.386						
M-AOL	0.106	0.177					
M-SB	0.212	0.163	0.136				
OE	0.592	0.555	0.066	0.238			
SE	0.136	0.665	0.167	0.097	0.392		
SB	0.731	0.374	0.039	0.302	0.649	0.141	

Convergent validity is tested with Smart PLS by extracting the factor loadings and cross loadings of all indicator items to their respective latent construct. The results are shown in Table 4. According to the respective table, all the items loaded (the bolded factor loadings) on their respective construct from lower bound of 0.72 to an upper bound of 0.98 and more highly on their respective construct than on any other construct (the non-bolded factor loadings in any one row). Throughout the process of exploratory factor analysis, items that do not load properly on a particular factor (<0.40) or have cross loadings should be deleted. However, all items had loadings greater than 0.40, so none were deleted.

Table 4: Factor Loading and Cross Loadings

	AOL	KS	OE	SB	SE
AOB1	**0.721**	0.156	0.334	0.423	0.066
AOB2	**0.84**	0.197	0.358	0.48	0.079
AOB3	**0.902**	0.326	0.405	0.551	0.123
KSB1	0.154	**0.792**	0.259	0.088	0.489
KSB2	0.229	**0.849**	0.381	0.234	0.538
KSB3	0.379	**0.466**	0.314	0.356	0.152
KSB4	0.262	**0.437**	0.248	0.277	0.176
KSB5	0.226	**0.832**	0.368	0.237	0.471
KSB6	0.146	**0.822**	0.224	0.13	0.514
OE1	0.314	0.288	**0.758**	0.383	0.246

OE2	0.219	0.327	**0.727**	0.251	0.288
OE5	0.406	0.285	**0.749**	0.412	0.212
OE6	0.387	0.307	**0.718**	0.434	0.118
SB3	0.449	0.25	0.384	**0.801**	0.048
SB4	0.474	0.26	0.409	**0.858**	0.173
SB5	0.502	0.201	0.42	**0.834**	0.07
SB6	0.545	0.183	0.429	**0.78**	0.077
SE1	0.025	0.541	0.186	0.081	**0.848**
SE2	0.042	0.251	0.186	0.034	**0.582**
SE3	0.11	0.491	0.159	0.064	**0.842**

We have seen from the measurement models how the constructs measures used in this study are reliable and valid. The next step in PLS-SEM is an evaluation of the structural model. Before moving on, it is important to examine the level of collinearity in the structural model (Hair, Ringle, & Sarstedt, 2011).

Table 5 shows the estimated path coefficients. The test of significance of all paths was performed using the bootstrapping technique. The t-value can be compared with the critical values from the standard normal distribution to decide whether the coefficients are significantly different from zero. For example, the critical values for significance level of 5% (a=0.05) probability of error is 1.96, respectively (two-tailed test). One tailed test for 5% (a=0.5) level is 1.645, respectively.

The results of the PLS model via bootstrapping technique indicated in Table 5 shows the T-value of direct paths of SE -> KS is 9.641, OE -> KS is 3.171. T-value reveal that the structural model for both direct relationship is statistically significant. The coefficients of direct and indirect paths of moderating effect of supportive leadership and achievement oriented leadership also tested. Respectively, the moderating effect of self-efficacy and supportive leadership reveal = 2.068. While, the moderating effect of outcome expectancy and achievement oriented leadership reveal = 2.051. Respectively, both relationship indicate a positively significant relationship by using the critical values for significance level of 5% (a=0.05) probability of error is 1.96 (two-tailed test).

Table 5 : Hypothesis Testing for Direct and Moderating Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
AOB -> KSB	0.101	0.101	0.048	2.102	0.018
OE * AOB -> KSB	0.075	0.073	0.036	2.051	0.02
SE * SB -> KSB	0.093	0.086	0.045	2.068	0.02
OE -> KSB	0.199	0.208	0.063	3.171	0.001
SE -> KSB	0.491	0.489	0.051	9.641	0
SB -> KSB	0.049	0.054	0.054	0.899	0.184

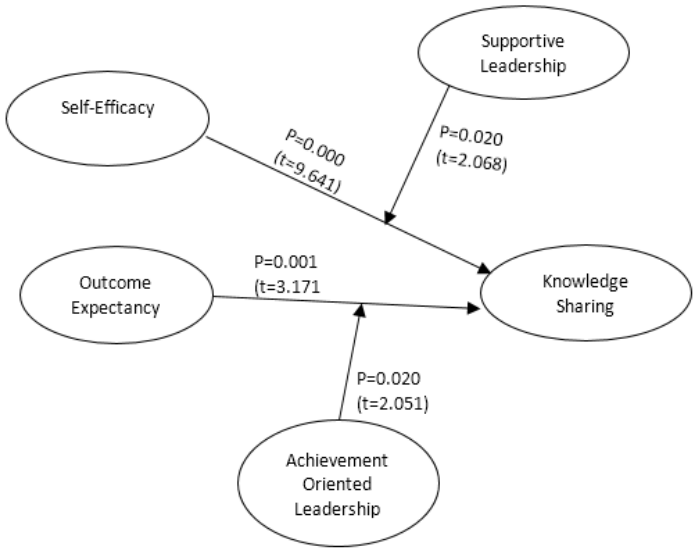

Figure 3: T-value and P-value of the structural measurement relationship

Figure 3 shows the results of the structural model, where the beta values of path coefficient indicate the direct influences of predictor upon the predicted latent constructs. According to the results, outcome expectancy and self-efficacy showed a positive influence on knowledge sharing. This result support hypothesis (H1) and (H2), Results also indicate that supportive leadership behaviour positively moderates the relationship between self-efficacy and knowledge sharing behaviour supporting hypothesis (H3). In addition, Achievement oriented behaviour also positively moderate the relationship between outcome expectancy and knowledge sharing, satisfying hypothesis (H4).

Discussion

The main objective of this research is to uncover the intermediate mechanism of two types of leadership behaviour; supportive and achievement oriented leadership.

This study contributes to leadership literature by demonstrating the significant role of virtual leadership behaviour toward members of online programming communities' knowledge sharing. Results show supportive leadership behaviour can increase members' self-efficacy toward knowledge sharing in online programming community. This indicate that when a leader support members by nurturing an acquired belief in members abilities (cognitively and/or emotionally), this will lead to individual's motivating behaviour. According to Kerfoot (2001), people feel the fire of passion when inspired by their leader who drives them intrinsically to achieve the right way. The followers also will feel enthusiastic and passionate about purpose and values of their work (Bandura, 1986). This type of leadership behaviour if cultivate by a virtual leader will foster the feeling of appreciation within members toward their perceived leaders and to their community as Wellman and Gulia (1999) argue that the stronger your attachment is to virtual community, you are more likely to participate in that community and eventually will support other members as well because one commonality is that being supported by others will make you support others as well (M McLure Wasko & Faraj, 2000).

Achievement oriented leadership also essential in moderating outcome expectancy toward knowledge sharing in online programming communities. This shows that, by having leaders who can boost and strengthen members' capabilities on accomplishing challenging goals will increase the members contribution towards online programming community.

In terms of practical contribution, the community manager or moderator should focus on providing and cultivating achievement oriented environment by providing internal and external reward for their members. In comparison with traditional physical organization, achievement leadership focus on the promotion to higher ranks and appraisals for the staff, the achievement is somewhat similar. In online communities, achievement leadership can motivate members' contributions through assigning a position rank to their members (e.g beginners, intermediate, advanced) as it exist in Linux and gaming communities (Ducheneaut et al., 2007). In addition, assigning contribution point toward project valued by other members. However, unlike traditional organization. In online programing community, there is no monetary reward associated with the promotion to higher ranks.

Another approach for leaders to recognize achievement of the members are through challenging members to add a new functionality in system development. Monitoring the time and progress of their programming skills in development, they may be given project after passing the assessment. This will help online programming community to get more members who intend to improve themselves by participating and sharing their knowledge with each other and decrease lurking. Therefore, leaders who cultivate these types of leadership will decrease the dropout among members demonstrated by previous studies and ensure the sustainability of the online programming community.

Conclusion

Current study have been collected from 20 online programming communities. This study's findings contribute to the existing body of knowledge by demonstrating the significant dual role of leadership moderating between knowledge sharing behaviour. The finding implied that although online communities are informal in nature, the appropriate type of leadership can boost the members' efficacy and outcome expectancy to participate in knowledge sharing. Ideally, with the appropriate level of autonomy and recognition of members contributions can motivate members to continuously contribute and promote sustainability in online programming communities.

References and Citations

Abouzahra, M., & Tan, J. (2014). *The Effect of Community Type on Knowledge Sharing Incentives in Online Communities: A Meta-analysis.* Paper presented at the System Sciences (HICSS), 2014 47th Hawaii International Conference on.

Al-Husseini, S. J. (2014). The Impact of Leadership Style on Innovation in Iraq's Higher Education Institutions: The Role of Knowledge Sharing.

Ardichvili, A., Maurer, M., Li, W., Wentling, T., & Stuedemann, R. (2006). Cultural influences on knowledge sharing through online communities of practice. *Journal of Knowledge Management, 10*(1), 94-107.

Avolio, B. J. (2016). Introduction: The Golden Triangle for Examining Leadership Developmental Readiness. *New directions for student leadership, 2016*(149), 7-14.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.

Bock, G.-W., Zmud, R. W., Kim, Y.-G., & Lee, J.-N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS quarterly*, 87-111.

Bradshaw, R., Chebbi, M., & Oztel, H. (2015). Leadership and Knowledge Sharing. *Asian Journal of Business Research, 4*(3). doi:10.14707/ajbr.150001

Cacioppe, R. (2000). Creating spirit at work: Re-visioning organization development and leadership-Part I. *Leadership & Organization Development Journal, 21*(1), 48-54.

Chang, Y.-S., Hsu, S.-F., Liao, C.-H., & Lin, S.-C. (2013). Knowledge sharing in online communities: Subjective norm, trust, media richness, and the individual's role in knowledge sharing. Paper presented at the World Conference on Educational Media and Technology.

Chiu, C.-M., Hsu, M.-H., & Wang, E. T. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems, 42*(3), 1872-1888.

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS quarterly*, 145-158.

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

Dong, T.-P., Dong, T.-P., Hung, C.-L., Hung, C.-L., Cheng, N.-C., & Cheng, N.-C. (2016). Enhancing knowledge sharing intention through the satisfactory context of continual service of knowledge management systems. *Information Technology & People, 29*(4), 807-829.

Ducheneaut, N., Moore, R. J., & Nickell, E. (2007). Virtual "third places": A case study of sociability in massively multiplayer games. *Computer Supported Cooperative Work (CSCW), 16*(1-2), 129-166.

F.Shahatha, A., & Ahmad, R. (2018). The Moderating Effect of Virtual Leadership Behaviors Towards Knowledge Sharing In Online Programming Communities. *Journal of Information System and Technology Management, 3*(7), 97-112.

Faraj, S., Jarvenpaa, S. L., & Majchrzak, A. (2011). Knowledge collaboration in online communities. *Organization science, 22*(5), 1224-1239.

Faraj, S., Kudaravalli, S., & Wasko, M. M. (2015). Leading Collaboration in Online Communities. *MIS quarterly, 39*(2), 393-412.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 39-50.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice, 19*(2), 139-152.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science, 43*(1), 115-135.

Hew, K. F., & Hara, N. (2007). Knowledge sharing in online environments: A qualitative case study. *Journal of the American Society for Information Science and Technology, 58*(14), 2310-2324.

Hildreth, P., Kimble, C., & Wright, P. (2000). Communities of practice in the distributed international environment. *Journal of Knowledge Management, 4*(1), 27-38.

Hsu, M.-H., Ju, T. L., Yen, C.-H., & Chang, C.-M. (2007). Knowledge sharing behavior in virtual communities: The relationship between trust, self-efficacy, and outcome expectations. *International journal of human-computer studies, 65*(2), 153-169.

Huang, L.-C., Ting, I.-H., & Chou, S.-C. T. (2014). The key factors of knowledge sharing in online community Learning Technology for Education in Cloud. MOOC and Big Data (pp. 105-113): Springer.

Huffaker, D., & Lai, J. (2007). Motivating online expertise-sharing for informal learning: The influence of age and tenure in knowledge organizations. Paper presented at the Advanced Learning Technologies, 2007. ICALT 2007. Seventh IEEE International Conference on.

Ipe, M. (2003). Knowledge sharing in organizations: A conceptual framework. *Human resource development review, 2*(4), 337-359.

Johnson, S. L., Safadi, H., & Faraj, S. (2015). The Emergence of Online Community Leadership. *Information Systems Research, 26*(1), 165-187. doi:10.1287/isre.2014.0562

Kankanhalli, A., Tan, B. C., & Wei, K.-K. (2005). Contributing knowledge to electronic knowledge repositories: an empirical investigation. *MIS quarterly*, 113-143.

Kerfoot, K. (2001). On leadership: From motivation to inspiration leadership. *Pediatric nursing, 27*(5), 530.

Kirkpatrick, S. A., & Locke, E. A. (1996). Direct and indirect effects of three core charismatic leadership components on performance and attitudes. *Journal of applied psychology, 81*(1), 36.

Kline, R. (2011). Principles and Practice of Structural Equation Modeling, 3rd edn Guilford Press. *New York*.

Lai, H.-M., & Chen, T. T. (2014). Knowledge sharing in interest online communities: A comparison of posters and lurkers. *Computers in Human Behavior, 35*, 295-306.

Lakhani, K. R., & Von Hippel, E. (2003). How open source software works:"free" user-to-user assistance. *Research policy, 32*(6), 923-943.

Liao, C., To, P.-L., & Hsu, F.-C. (2013). Exploring knowledge sharing in virtual communities. *Online Information Review, 37*(6), 891-909.

Li, W. (2009). Online knowledge sharing among Chinese and American employees: Explore the influence of national cultural differences. International Journal of Knowledge Management (IJKM), 5(3), 54-72.

Li, W., Ardichvili, A., Maurer, M., Wentling, T., & Stuedemann, R. (2007). Impact of Chinese culture values on knowledge sharing through online communities of practice. International Journal of Knowledge Management (IJKM), 3(3), 46-59.

Limpisook, N. (2009). Exploring consumers' multi-motives on knowledge sharing in online brand community: The moderating effect of trust, opportunity and ability. 1-95.

Ma, W. W. K., & Yuen, A. H. K. (2010). Understanding online knowledge sharing: An exploratory theoretical framework Hybrid Learning (pp. 239-248): Springer.

Mockus, A., Fielding, R. T., & Herbsleb, J. D. (2002). Two case studies of open source software development: Apache and Mozilla. *ACM Transactions on Software Engineering and Methodology (TOSEM), 11*(3), 309-346.

Northouse, P. G. (2015). *Leadership: Theory and practice*: Sage publications.

Nunnally, J. C., & Bernstein, I. H. (1978). Psychometric theory.

Papadopoulos, T., Stamati, T., & Nopparuch, P. (2013). Exploring the determinants of knowledge sharing via employee weblogs. International Journal of Information Management, 33(1), 133-146.

Schwartz, A., & Timbolschi-Preoteasa, M. (2015). Transparency in the era of the Internet Internet Service Providers-the new gatekeepers of communication. *Revista Româna de Jurnalism si Comunicare, 10*(2), 33.

Sheng, M., & Hartono, R. (2015). An exploratory study of knowledge creation and sharing in online community: A social capital perspective. Total Quality Management & Business Excellence, 26(1-2), 93-107.

Suh, A., & Shin, K.-S. (2010). Exploring the effects of online social ties on knowledge sharing: A comparative analysis of collocated vs dispersed teams. Journal of Information Science, 36(4), 443-463.

Tseng, F.-C., & Kuo, F.-Y. (2014). A study of social participation and knowledge sharing in the teachers' online professional community of practice. Computers & Education, 72, 37-47.

Van den Hooff, B., & de Leeuw van Weenen, F. (2004). Committed to share: commitment and CMC use as antecedents of knowledge sharing. *Knowledge and process management, 11*(1), 13-24.

von Krogh, G., Nonaka, I., & Rechsteiner, L. (2012). Leadership in Organizational Knowledge Creation: A Review and Framework. *Journal of Management Studies, 49*(1), 240-277. doi:10.1111/j.1467-6486.2010.00978.x

Wang, & Lantzy, S. (2011). A systematic examination of member turnover and online community health.

Wang, Y., & Fesenmaier, D. R. (2003). Assessing motivation of contribution in online communities: An empirical investigation of an online travel community. *Electronic markets, 13*(1), 33-45.

Wasko, M. M., & Faraj, S. (2000). "It is what one does": why people participate and help others in electronic communities of practice. *The Journal of Strategic Information Systems, 9*(2), 155-173.

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

Wellman, B., & Gulia, M. (1999). Net surfers don't ride alone: Virtual communities as communities. *Networks in the global village*, 331-366.

Yoo, Y., & Alavi, M. (2004). Emergent leadership in virtual teams: what do emergent leaders do? *Information and Organization, 14*(1), 27-58. doi:10.1016/j.infoandorg.2003.11.001

Yuan, Y. C., Cosley, D., Welser, H. T., & Xia, L. (2009). The diffusion of a task recommendation system to facilitate contributions to an online community. *Journal of Computer-Mediated Communication, 15*(1), 32-59.

Yukl, G. (1999). An evaluation of conceptual weaknesses in transformational and charismatic leadership theories. *The Leadership Quarterly, 10*(2), 285-305.

Zhang, X., Zhang, Y., Sun, Y., Lytras, M., Ordonez de Pablos, P., & He, W. (2017). Exploring the effect of transformational leadership on individual creativity in e-learning: a perspective of social exchange theory. *Studies in Higher Education*, 1-15.