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THE MODERATING EFFECT OF VIRTUAL LEADERSHIP BEHAVIORS TOWARDS KNOWLEDGE SHARING IN ONLINE PROGRAMMING COMMUNITIES

Abdulrazak F.Shahatha[1]
Rahayu Ahmad[2]

[1] School of Computing, College of Art and Sciences, Universiti Utara Malaysia 06010, Sintok, Kedah, Malaysia
Email: qazakian@gmail.com
[2] School of Computing, College of Art and Sciences, Universiti Utara Malaysia 06010, Sintok, Kedah, Malaysia
Email: rahayu@uum.edu.my

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Abstract: *Although there is a significant growth of emerging online programming communities, little succeeded in encouraging members to contribute and share their knowledge. Addressing problems of low contribution trigger researchers to examine the role of leadership in virtual communities. This study grounded on path-goal theory, examines the role of participative leadership and achievement oriented leadership behaviour toward knowledge sharing in online programming community. This proposed model is tested empirically using data collected from 20 online programming communities. The result from the structural equation modelling suggests that outcome expectancy and self-efficacy 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 to participate in knowledge sharing. Ideally, with the appropriate 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, Path Goal Theory, Social Cognitive Theory.*

Introduction

Online programming communities is a place for a wide group of programmers with regular interest in programming and development skills that interact and share great amounts of resources with each other via the Internet (Schwartz & Timbolschi-Preoteasa, 2015). These communities joined by thousands of people across national, time zone and geographical boundaries.

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. The value of interaction is an important part of knowledge sharing among members of online programming communities. Continuous knowledge sharing helps in development of skills required by converting tacit knowledge into explicit knowledge (Al-Husseini, 2014). Online programming 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.

Despite the rapid growth and rich diversity of the online programming 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 take the lead in examining the dual leadership role in moderating members' efficacy and outcome expectancy towards knowledge sharing.

Literature Review and Research Problems

Online Communities and Knowledge Sharing

Members' contributions are very crucial for ensuring the survival of online communities. Previous studies show that despite the significant increasing numbers of emerging online communities, few of them succeeded in retaining and motivating their members to share knowledge. This lead to a serious problem of under contribution and inactivity after extended period of time even 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. While, the top 5% of contributors in Wikipedia made 44% of the total edits (Yuan, Cosley, Welser, & Xia, 2009). 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.

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. 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. 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. Such as 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).

In this study, participative 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 have control in developing online programming community together with leaders. Thus, they need more participative leaders. In addition, adding leaders behavior that can guide leaders to build an achievement oriented environment that will create value internally and externally for followers that will motivate 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 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, 2015).

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, Participative 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.

Characteristics of online programming community members who participate in a volunteer environment and sharing their professional expertise in creative and innovative work shows that they are keen to have control in developing online programming community together with leaders. Thus, this characteristic of members are appropriate to have a participative leaders who can foster the feeling of ‘‘psychological ownership’’ on their members (Sashkin, 1976), and increase followers feelings of self-efficacy and control, and reduce their sense of powerlessness (Arnold, Arad, Rhoades, & Drasgow, 2000).

Community of practice members like programmers also like to expand their knowledge in their field thus, needing a challenging activity which can provide internal and external reward to stimulate their participation and motivate them toward achieving their goal, thus, they need an achievement oriented leaders who can provide stimulating and challenging environment to make feel motivated to contribute to the online programming community.

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

Source: (Northouse, 2016).

The personal characteristics that influence members 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 contribute by participating and achieving their goals following the role of each leadership behavior.

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

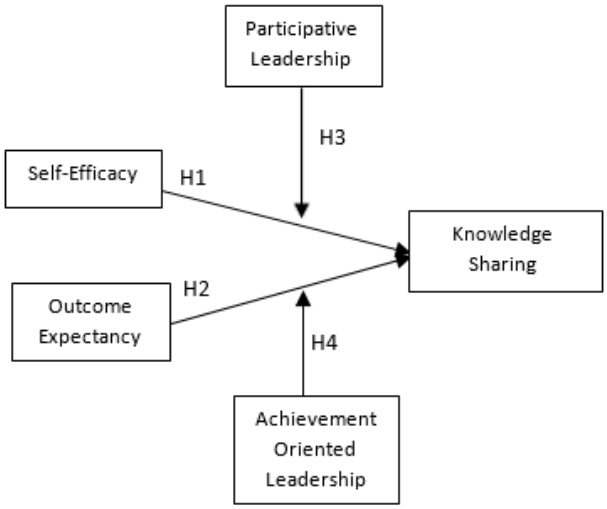

Figure 2: Conceptual Framework

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 another 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,

H_1: Self-efficacy has a positive effect on 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; 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:

H_2: Outcome expectancy has a positive effect on knowledge sharing behavior.

According to Northouse (2015), A great deal of research has been designed to study other types of leadership like directive and supportive leadership. However, fewer studies address participative and achievement-oriented leadership. Since most of online programming communities are voluntary platform, participative leadership behavior of a leader can help tremendously in motivating members of online communities to decide their own creative and innovative way of contributing to the online programming communities. According to Sashkin (1976), increasing the degree in which follower participate in decision making may increase performance through enhanced motivation . This leadership holds strong for the expert in the field who are sharing their expertise and skills that can bring ideas and contribution toward developing and enriching the functionality of the online programming communities. Participative leadership tends to foster the feeling of ‘‘psychological ownership’’ of followers (Sashkin, 1976), increase followers feelings of self-efficacy and control, and reduce their sense of powerlessness (Arnold et al., 2000).

Prior research suggests that the participative behavior of leader plays a vital role in providing followers with experience of intrinsic motivation, feelings of self-worth, and a sense of self-determination (Deci, Connell, & Ryan, 1989). Similarly, some authors have suggested that participative leadership is likely to induce the feeling of empowerment among followers (Ahearne, Mathieu, & Rapp, 2005; Leach, Wall, & Jackson, 2003). The feeling of psychological empowerment has been conceptualized as a form of intrinsic motivation to perform tasks, manifested in four cognitive dimensions: meaning, impact, competence, and self-determination (Conger & Kanungo, 1988; Spreitzer, 1995; Thomas & Velthouse, 1990). Hence, By giving a freedom for members to take part in any project they desire, and by inducing empowerment and trust toward followers, will enhance members motivation and performance (Huang, Davison, Liu, & Gu, 2009).

Due to the aforementioned argument and the limited studies focusing on this leadership, we hypothesize participative leadership are vital for motivating online community members toward sharing their knowledge. Thus,

H_3: Participative leadership positively moderates the effect of self-efficacy on knowledge sharing.

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,

H_4: 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

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. 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: Some survey questionnaire

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 "Participative Leadership behavior" are:	
1)	The most influential members consult me when I share my ideas in this Online Programming Community
2)	The most influential members always ask for my suggestions concerning how to enhance community contribution in 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 the total, male = 85 percent and female = 15 percent. In terms of age distribution, 15 percent of them were between 13-20 years old, 47.5 percent between the age of 21-30 years, 24.1 percent from the age of 31-40 years, 9.1 percent between the age 41-50 years, 3.1 percent between the 51-60 years, and the rest were above 61 years with 1.2 percent. In terms of education level, 2.8 percent primary school graduate, 20 percent received secondary school graduate, 16.9 percent diploma graduate, 38.4 percent bachelor degree graduate, 16.6 percent master degree graduate and 5.3 percent PhD degree graduate. In terms of experience in using online programming communities, 20.9 percent have experience joining online programming communities less than 1 year, 43.4 percent joined 1 to 3 years, 17.5 percent joined 3 to years, 6.9 percent joined for 5 to 7 years and the rest with 11.3 percent joined more than 7 years .

Table 2: Characteristics of Respondents and online programming communities' categories

Gender	**Frequency**	**Percentage (%)**	**OPC Category**	**Frequency**	**Percentage (%)**
Male	272	85%	JavaScript	47	14.7%
Female	50	15%	SQL	9	2.8%
Age	**Frequency**	**Percentage (%)**	Java	21	6.6%
13-20 Years	48	15%	C#	22	6.9%
21-30 Years	152	47.5%	Python	64	20%
31-40 Years	77	24.1%	PHP	25	7.8%
41-50 Years	29	9.1%	C++	28	8.8%
51-60 Years	10	3.1%	C	11	3.4%
Over 61 Years	4	1.3%	Ruby	2	0.6%
Education Level	**Frequency**	**Percentage (%)**	Swift	2.8	2.8%
Primary School	9	2.8%	VB.Net	7	2.2%
Secondary School	64	20%	Assembly	2	0.6%
Diploma	54	16.9%	R	6	1.9%
Bachelor Degree	123	38.4%	Perl	10	3.1%
Master Degree	53	16.6%	CSS	4	1.3%
PhD	17	5.3%	Matlab	7	2.2%
Experience using OPC	**Frequency**	**Percentage (%)**	Visual Basic	1	0.3%
Less than 1 year	67	20.9%	Go	1	0.3%
1 to 3 years	139	43.4%	Other OPC	44	13.8%
3 to 5 years	56	17.5%			
5 to 7 years	22	6.9%			
More than 7 years	36	11.3%			

* **OPC** : Online Programming Community

Analyses and Results

Reliability results of testing measurement model are shown in Table 3. 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 3 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 3: Reliability Assessment of the Measurement Model

	AVE	Composite Reliability	R Square	Cronbachs Alpha	Fornell-Larcker Criterion						
					AOL	KS	M-AOL	M-PB	OE	PB	SE
AOL	0.677	0.862	0.0000	0.777	**0.823**						
KS	0.713	0.909	0.441	0.866	0.229	**0.844**					
M-AOL	1.000	1.000	0.0000	1.000	0.078	0.137	**1**				
M-PB	1.000	1.000	0.0000	1.000	0.253	-0.04	0.201	**1**			
OE	0.542	0.826	0.0000	0.722	0.435	0.374	-0.049	0.185	**0.736**		
PB	0.659	0.885	0.0000	0.831	0.597	0.399	0.123	0.267	0.483	**0.812**	
SE	0.578	0.871	0.0000	0.816	0.115	0.597	0.15	-0.134	0.298	0.243	**0.76**

Note: (**AOL**: Achievement Oriented Leadership, **KS**: Knowledge Sharing, **M-AOL**: Moderator-Achievement Oriented Leadersip, **M-PB**: Moderator-Participative Leadership **OE**: Outcome Expectancy, **PB**: Participative 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 4. 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 4, however, all values surpassed HTMT.85.

Table 4: Heterotrait-monotrait (HTMT)

	AOL	ANO	KS	M-OAL	OE	SE
AOL						
KS	0.249					
M-AOL	0.111	0.153				
M-PB	0.292	0.044	0.201			
OE	0.592	0.458	0.060	0.232		
PB	0.735	0.446	0.137	0.290	0.640	
SE	0.136	0.687	0.163	0.145	0.392	0.273

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 5. 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 that 0.40, so none were deleted.

Table 5: Factor Loading and Cross Loadings

	AOL	KS	OE	PB	SE
AOB1	**0.719**	0.119	0.326	0.391	0.066
AOB2	**0.83**	0.139	0.35	0.492	0.078
AOB3	**0.909**	0.256	0.395	0.563	0.122
KSB1	0.157	**0.817**	0.263	0.244	0.49
KSB2	0.231	**0.875**	0.386	0.424	0.538
KSB5	0.228	**0.837**	0.371	0.379	0.471
KSB6	0.147	**0.848**	0.226	0.282	0.516
OE1	0.314	0.264	**0.767**	0.394	0.243
OE2	0.219	0.334	**0.763**	0.251	0.287
OE5	0.405	0.233	**0.724**	0.431	0.21
OE6	0.388	0.251	**0.689**	0.388	0.117
PB1	0.429	0.398	0.384	**0.813**	0.25
PB2	0.494	0.312	0.435	**0.833**	0.185
PB3	0.586	0.23	0.396	**0.815**	0.16
PB4	0.472	0.312	0.356	**0.786**	0.168
SE1	0.026	0.567	0.191	0.198	**0.851**
SE2	0.043	0.258	0.195	0.033	**0.58**
SE3	0.11	0.519	0.164	0.195	**0.846**
SE4	0.178	0.418	0.326	0.244	**0.767**
SE5	0.091	0.43	0.298	0.209	**0.723**

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 6 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 4 shows the T-value of direct paths of SE -> KS is 10.290, OE -> KS is 2.986. 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 participative leadership and achievement oriented leadership also tested. Respectively, the moderating effect of self-efficacy and participative leadership reveal = 2.069. While, the moderating effect of outcome expectancy and achievement oriented leadership reveal = 2.018. 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 6: Hypothesis Testing for Direct and Moderating Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
AOB -> KSB	-0.024	-0.022	0.052	0.469	0.32
OE * AOB -> KSB	0.09	0.084	0.045	2.018	0.022
SE * PB -> KSB	0.094	0.091	0.045	2.069	0.02
OE -> KSB	0.165	0.171	0.055	2.986	0.001
PB -> KSB	0.24	0.237	0.056	4.268	0
SE -> KSB	0.463	0.467	0.045	10.29	0

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 participative 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).

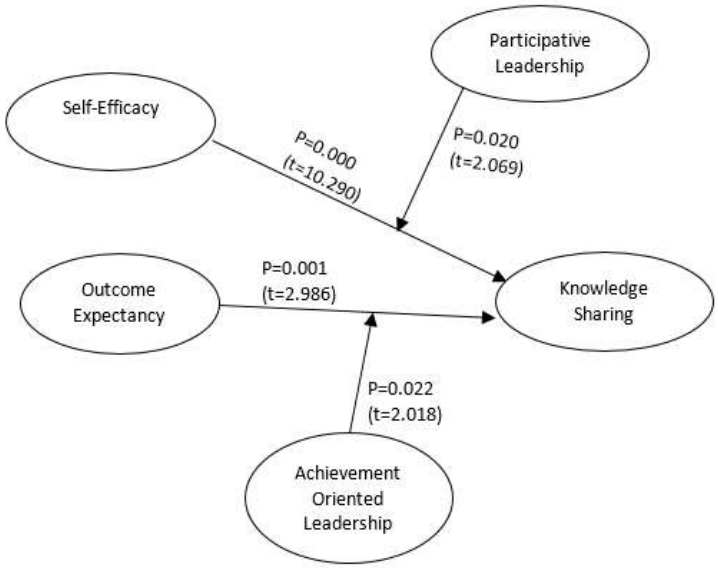

Figure 3: T-value and P-value of the structural measurement relationship

Discussion

The main objective of this research is to uncover the intermediate mechanism of two type of leadership behaviour components that are participative and achievement oriented leadership. The results show participative leadership behaviour serves as moderator between self-efficacy and knowledge sharing. In addition, achievement oriented leadership also positively moderates the relationship between outcome expectancy and knowledge sharing behaviour in online programming community.

This study contributes to leadership literature by demonstrating the significant role of virtual leadership behaviour can have on member of online programming community knowledge sharing. Results show participative leadership behaviour can increase members' self-efficacy toward knowledge sharing in online programming community. This indicate that when members perceived they have the abilities to contribute, their knowledge sharing behaviour will be amplified when they are included by the leader to participate in decision making, through deciding their own creative and innovative way of contributing. This moderating role of participative leadership holds this for the professional workers who are sharing their expertise and programming skills that can bring ideas and contribution toward developing and enriching the functionality of the online programming communities. This type of leadership behaviour if cultivate by a virtual leader will tends to foster the feeling of members ''psychological ownership'' among followers (Sashkin, 1976).

Practically, community managers and moderators can nurture the motivation of their members by paying a special attention toward giving their members a sense of ownership of the online programming community, by giving them an opportunity to decide what the community are heading to by creating free platform to work on project and ask other members to participate in it.

Achievement oriented leadership also essential in moderating outcome expectancy toward knowledge sharing in online programming communities. This shows that, by having leaders that play their role in creating achievement oriented environment for the followers and guide and strengthen their capability on accomplishing challenging goals will increase the members contribution towards online programming community.

In practical, 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.

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