



Openness' and Organizational Factors' Effects on Learning Behavior

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Abstract

This study investigates the influence of openness, collaborative culture, and organizational climate on learning behavior (i.e. knowledge-sharing and explorative learning) in the Taiwanese technology industry. Data were collected from 200 participations working in 42 technological companies; 178 participants were used to perform hierarchical linear modeling. Openness and collaborative culture were related positively to learning behavior, learning behavior influenced organizational climate negatively, and collaborative culture and organizational climate did not moderate openness and learning behavior. This study uses two-level variables to examine influences on learning behavior. Using hierarchical linear modeling, two-level variables and moderating effects are examined simultaneously. The primary contribution of this study is demonstrating that organizational climate types influence learning behavior; the wrong climate weakens learning behavior, especially explorative learning.

Keywords: learning behavior; knowledge-sharing; explorative learning; openness; collaborative culture; organizational climate

1. Introduction

Many studies discuss knowledge-sharing [43], organizational learning [12], or both [22], suggesting that the two topics play important roles in theory and practice. Since businesses confront rapidly changing environments, they have to gain

more competencies, especially in the technology industry (Ratten and Ratten, 2007). Therefore, we set organizational learning style as explorative learning. Knowledge-sharing is learning from others [48], and explorative learning is a style of learning behavior [32]. We integrate them and create the new variable — learning behavior. We examine whole learning behavior's changing, not just knowledge-sharing or explorative learning.

The purpose of this study is to develop and test a multilevel framework in which learning behavior is conceptualized as a joint function of openness and collaborative culture and organizational climate. Schildt *et al.* [37] find that one collaboration style (corporate venturing) is related to the explorative learning. So collaboration plays a critical role in explorative learning between organizations, and we explore collaboration within organizations. Thus, we discuss the influence of organizational environments on explorative learning, including direct and moderating effects. Watanabe *et al.* [46] explain openness and continuous learning have positive correlation, and openness is positively related to continuous learning. Based on these traits, we use openness to predict learning behavior.

Tu [45] and Lin [27] survey Taiwan's high-tech firms. Lin [27] proposes that organizational structure characteristics are positively related to knowledge-sharing in high-tech industry. We use HLM to understand the characteristics of technology companies and employees influence learning behavior, because HLM can discuss both levels on learning behavior simultaneously.

2. Literature Review

2.1 Learning Behavior

Organizations should pay attention to learning behaviors because they are enablers in many practices, such as KM, meetings, task-group creation, and sharing experience [38]. Petruzzelli *et al.* [32] propose that exploration was a learning behavior. In the study by Yang [48], he described that knowledge-sharing and organizational learning were closely connected, and obtained the correlation coefficient was 0.6 ($p < .01$), which achieved significant level. Based on these studies, we combined knowledge-sharing and organizational learning to one concept, and explorative learning is one style of organizational learning [25], so we used them to discuss learning behavior.

Knowledge-sharing is voluntary dissemination process of skills and experiences to others via various channels to help learning. Knowledge-sharing appears in an organization, dissemination of knowledge and experience occurs from individual or group to another [15, 22, 26]. Knowledge-sharing not only increases the value of knowledge utilization, it improves individual and organizational performance and benefits both individuals and groups [20, 41, 43]. Nevertheless, knowledge-sharing is a difficult work, the willingness of a worker to share and integrate his/her knowledge is the main barrier. So, coordination in an operating adhocracy can be achieved through mutual adjustment, and makes this become team spirit and facilitates the integration of individual tacit knowledge within team [21].

Explorative learning occurs when an organization acquires behavioral capacities that differ from current paradigms [25], focuses on learning by generating variation; explorative activities generate knowledge that often differs from the existing knowledge base of the company [37], begins with an individual's insight [3], and focuses on improving the existing and established knowledge [2]. Moreover, Desyllas and Hughes [9] indicate that explorative learning can revitalize the firms and enhance the firms' knowledge base. Explorative learning needs to search and a departure from the established firm's store of existing knowledge and skills. Furthermore, when a firm provides access to more explorative learning that can

improves the generation of new technological capabilities [19]. Therefore, explorative learning can cause new knowledge.

2.2 Openness

The characteristics of openness to experience include imaginative, culture, experience-seeking, and curious [8]. People with high openness to experience have greater access to various feelings, thoughts, perspectives, ideas, willing to think about new ideas, having more experience and new ways to do things and to solve problems [13]. Moreover, the importance of openness to experience may be varying to different organizational settings and cultures [1]. In the study of Tews *et al.*[42], they examine the correlation between openness to experience and learning orientation, and the result shows they have significantly positive correlation.

Collaborative culture

Collaboration occurs when business parties work together to achieve common goals [7]. From a structure viewpoint, collaboration emphasizes communicative behavior, and process focuses on communication, environmental, and contextual factors [17]. Additionally, collaboration can be viewed as the vehicle for learning, and individual can learn things from others [14]. López *et al.* [18] test the effect of collaborative culture on organizational learning, and suggest that collaborative culture influences organizational learning, moreover, collaborative culture is an approach to leverage knowledge through organizational learning.

2.3 Organizational Climate

Organizational climate is the common practices, shared beliefs, and value systems followed by an organization [6]. When social interaction leads to shared understandings among organizational members, an organization desires to develop climate, [10]. Organizational climate usually connects the thoughts, feelings, and organizational members' behaviors. Furthermore, fairness, affiliation, and innovativeness organizational climate is significant related to knowledge-sharing intention [4]. Pham and Swierczek [33] indicate that organizational learning is much related to organizational climate, and supportive organizational climate can facilitate learning process.

To confirm the effects of individual and organizational factors on learning behavior simultaneously, we use HLM to perform this study.

3. Theoretical Background

Following social cognitive theory (SCT), we understand a 3-way interaction among behavior, cognitive, and other personal factors, and environment factors. SCT is reciprocal, used to explain human psychosocial functioning [51]. The rapidly changing technological environment suggests that SCT is a useful theoretical framework to examine human behavior [34]. Based on this viewpoint, this study investigates employees who work in technology industries. Following Tsai and Cheng [44], SCT suggests that personal behavior influences organizational learning. The theoretical model developed for this study is that behavior refers to learning behaviors; personal factors represent openness, and environment factors include collaborative culture and organizational climates.

4. Research Hypotheses and Framework

According to SCT and the previous studies [1, 4, 13, 18, 21, 33, 42], we find that openness, collaborative culture, and organizational climate are related to knowledge-sharing and organizational learning. Thus, we use the three variables to predict knowledge-sharing and explorative learning; that is, learning behavior.

Knowledge-sharing usually occurs when a person is willing to help and to learn from other people in the development of new competencies [48]. Organizational learning occurs when organizational members solve problems by learning [25]. Based on these statements, we believe knowledge-sharing and explorative learning belong to learning behavior. We conceptualize openness as a personal factor. Openness supports sharing knowledge and develops positive knowledge management behaviors [31] and considers new ideas and try novel things [11], it is the core of explorative learning. Thus, we select openness as the individual factor to predict learning behavior.

H1. Openness is related to learning behavior.

We view organizational culture and climate as environment factors. Slater and Narver [39] propose a model of learning organization where delineated organizational culture and climate are important antecedents for organizational learning. López *et al.* [18] suggest that a collaborative culture is related positively to organizational learning. Organizational climate is associated positively with knowledge-sharing subjective norms [43]. Therefore, we use collaborative culture and organizational climate to predict learning behavior.

H2. Collaborative culture is related to learning behavior.

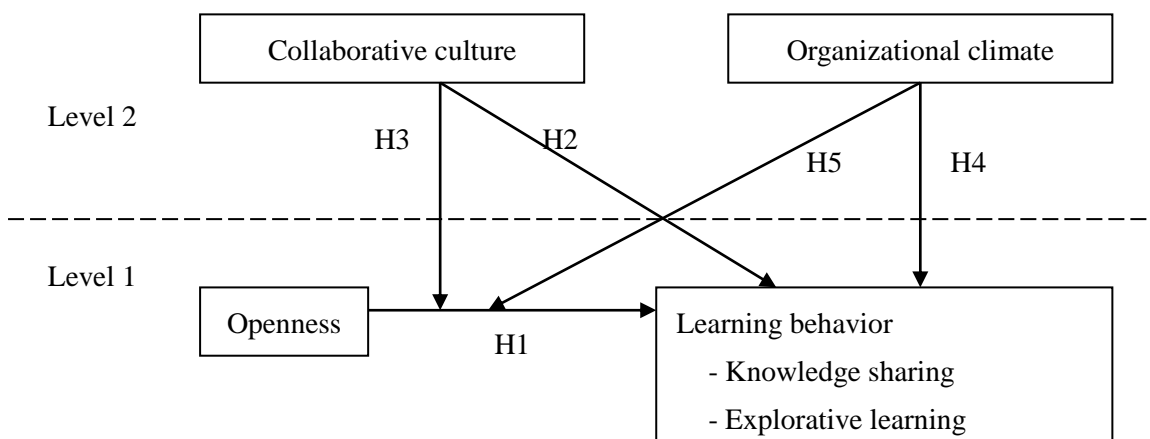
H3. The relationship between openness and learning behavior is greater when a company has higher collaborative culture.

H4. Organizational climate is related to learning behavior.

H5. The relationship between openness and learning behavior is greater when a company has a higher organizational climate.

This study explores five hypotheses in Figure 1, which includes two levels and four variables, and explores openness' effect on learning behavior through collaborative culture and organizational climate moderators in Taiwan technology companies. This framework takes account of the influences of individual and organizational factors simultaneously to learning behavior in technology industry, and this fills the previous studies only discuss factors in one level.

Fig 1: Research model



5. Research Design

5.1 Data Collection

We collected data from technology companies in Taiwan, selected because the environment changed rapidly in the technology industry [34]. Because high technology firms have to confront rapid and discontinuous changing, so organizational learning and the generation of novel knowledge are critical for long-term survival and renewal [29]. Technology companies research and develop new skills and products continuously through knowledge-sharing and explorative learning, so we chose technology industry to survey in this study.

We used a purposive sampling method. 250 questionnaires were distributed to participants; usable responses were 200, which came from 42 companies, 19 in the south and 23 in the north. The majority of respondents were male (59.5%). Respondent ages ranged from 18 to 58 years, and about 42.5 percent were middle managers.

5.2 Measurements

This study employs a multimeasure approach to operationalize the theoretical constructs. Instruments from extant studies operationalize the theoretical constructs, but several items were modified to make them suitable to this study's setting. This questionnaire included descriptive data and the locations of companies, learning behavior, openness, collaborative culture, and organizational climate.

The dependent variable was learning behavior, measured by knowledge-sharing and explorative learning. Referring to the questionnaires from the studies of Yang and Farn [50] and Lai *et al.*[20], we employed six items to examine knowledge-sharing; five items of explorative learning from Li *et al.*'s [23] study.

The independent variable was openness, it consisted of five items from the study of Soto and John [40]. Openness included two parts: aesthetics and ideas. However, aesthetics was not related to the purpose of this study, so we selected idea items to measure openness.

Moderate variables included collaborative culture and organizational climate. Collaborative culture was measured with six items by Rodríguez *et al.* [36]. Organizational climate measured cooperative and warm climates. Cooperative climate included two items measuring whether the company satisfied the needs of employees and whether employees hold a sense of security within the company [6]. Warmth measured the friendliness of the organization's atmosphere, consisting of five items proposed by Janz and Prasarnphanich [16].

Participants were asked to indicate to what extent they agree with the items on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). Cronbach's alphas for knowledge-sharing, explorative learning, openness, collaborative culture, organizational commitment measures were within acceptable standard with respectively 0.92, 0.93, 0.73, 0.96, and 0.84. An alpha of 0.70 was the minimum acceptable standard for demonstrating internal consistency [41]. We applied factor validity to determine the validity. The factor loadings of all items ranged from 0.526 to 0.926. Since all factor loadings exceed 0.40, no items were removed from analysis.

6. Results

6.1 Respondents' Demographics and Descriptive Statistics

Table 1 shows the respondents' demographics. Table 2 shows descriptive statistics including means, standard deviations, inter-correlations, and Cronbach's alpha coefficients.

Table 1
Profile of respondents

	<i>Frequency</i>	<i>Percentage (%)</i>
<i>Gender</i>		
Male	119	59.5
Female	81	40.5
<i>Age</i>		
< 20	2	1.0
20-29	37	18.5
30-39	116	58.0
40-49	30	15.0
50-59	11	5.5
Missing	4	2.0
<i>Marital status</i>		
Married	113	56.5
Single	84	42.0
Missing	3	1.5
<i>Education background</i>		
Seniority high school or below	6	3.0
Junior college	21	10.5
Bachelor	115	57.5
Master	55	27.5
Doctor	3	1.5
<i>Seniority</i>		
< 1	20	10.0
1-5	83	41.5
6-10	69	34.5
11-15	17	8.5
> 15	7	3.5
Missing	4	2.0
<i>Manager</i>		
Yes	85	42.5
No	112	56.0
Missing	3	1.5

Table 2
Descriptive statistics: means, SD, correlational matrix, and Cronbach's alpha

	Means	SD	1	2	3	4	5
1. KS	34.73	5.39	(.92)				
2. EL	27.05	5.51	.53**	(.93)			
3. O	22.70	4.20	.41**	.25	(.73)		
4. CC	30.38	6.94	.50**	.44**	.25**	(.96)	
5. OC	33.34	6.76	.48**	.42**	.23**	.64**	(.84)

Notes: ** $p < 0.01$, N = 200, KS = knowledge sharing, EOL = explorative learning, O = openness, CC = collaborative culture, OC = organizational climate, Cronbach's alpha in the parentheses

6.2 Hypotheses Testing

We calculated *Interclass correlation coefficient* (ICC) and $r_{WG(j)}$ before performing HLM; the two values were used to examine the viability of organizational-level constructs [24]. However, HLM cannot be performed with missing data so we removed 22 participants from the sample. The result was 178 participants for examining ICC, $r_{WG(j)}$, and hypotheses testing. ICC (1) is $0.37087 / (0.37087 + 0.58070) = 0.3897$; ICC (2) computes reliability of the mean is $0.37087 / [0.37087 + (0.58070 / 178)] = 0.9913$.

Since ICC (1) > 0.138 , a high correlation exists between dependent variable (learning behaviors) and within group; this relationship cannot be ignored, and ICC (2) exceeds 0.70. We tested the $r_{WG(j)}$ values of collaborative culture and organizational climate; values must exceed 0.70 [24]. We compute $r_{WG(j)}$ values for the four variables and yield values of 0.98 for learning behaviors, 0.96 for openness, 0.94 for collaborative culture and 0.96 for organizational climate. Both ICC (1) and $r_{WG(j)}$ are above standard and acceptable values so aggregation was permissible.

1) Null model

To test the hypotheses, we calculated the effect of cross-level effects, whether all companies have different variances for learning behaviors. The within-group variance components were significant ($\chi^2 = 108.023$, $df = 40$, $p < 0.001$, $\tau_{00} = 0.371$), and ICC (1) = 38.97%, indicating 38.97 percent of the variance in collaborative culture and organizational climate were shared among companies, and 61.03 percent of the variance resided within companies.

2) Random-coefficient regression model

Openness enters into the model. H1 predicts individual openness is associated with learning behaviors. We estimate level 1 model containing openness, and no predictors specified for the level 2 model. From Table 3, openness ($\hat{\gamma} = 0.342$, $t = 5.508$, $df = 40$, $p < 0.001$) had a positive relationship with learning behaviors; Therefore, H1 is supported. As openness increases by 1 unit, learning behavior increases by 0.342.

With regard to the random effect, $\hat{\pi}_{00} = 0.467$, $df = 17$, $\chi^2 = 53.200$, $p < 0.001$. Therefore, the 37 technology companies have different learning behaviors. This result is consistent with the null model. Moreover, $\hat{\pi}_{11} = 0.007$, $df = 17$, $\chi^2 = 25.526$, $p < 0.1$, demonstrating openness on learning behaviors is different among the companies.

3) Intercepts -as-outcomes model

We examine intercepts as explained by collaborative culture and organizational climate. We use this model to examine H2 and H4, so we check γ_{02} and γ_{03} . From Table 3, we see that collaborative culture ($\hat{\gamma} = 0.393, t = 2.545, df = 37, p = 0.015$) has a positive relationship with learning behaviors, but organizational climate ($\hat{\gamma} = -0.513, t = -3.199, df = 37, p = 0.003$) has a negative relationship. We conclude that both H2 and H4 are supported. So collaborative culture and organizational climate have direct effects on learning behaviors.

Table 3

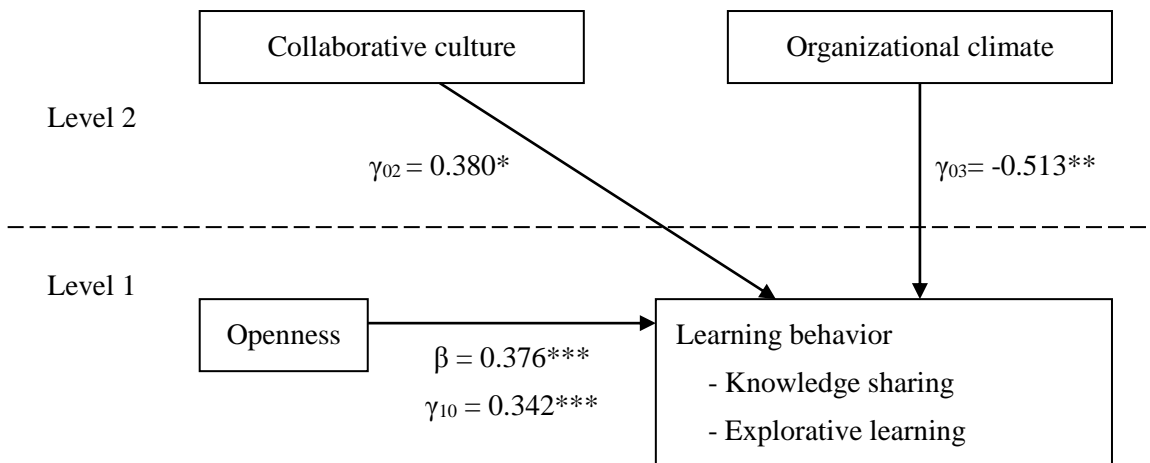
Hierarchical linear modeling results for learning behaviors

	<i>null model</i>	<i>random-coefficient regression model (H1)</i>	<i>intercepts-as-outcomes model (H2), (H4)</i>	<i>slope-as-outcomes model (H3), (H5)</i>
Fixed effects				
<i>Level 1</i>				
Interception (γ_{00})	5.570*** (0.128)	5.565*** (0.133)	5.332*** (0.906)	5.919*** (0.886)
Openness (γ_{10})		0.342*** (0.062)	0.581* (0.374)	0.749* (0.316)
<i>Level 2</i>				
Collaborative culture (γ_{02})			0.380* (0.168)	0.394* (0.156)
Organizational climate (γ_{03})			-0.513** (0.160)	-0.514** (0.160)
Interception (γ_{10})				0.027 (0.693)
Companies average openness (γ_{11})				-0.530 [†] (0.288)
Collaborative culture × openness (γ_{12})				-0.120 (0.186)
Organizational climate × openness (γ_{13})				0.214 (0.271)
Variance components				
<i>Between companies</i>				
Learning behaviors (τ_{00})	0.371***	0.467***	0.325***	0.319***
Openness slope (τ_{11})		0.007 [†]	0.001 [†]	0.010*
Within-company residual variance (σ^2)	0.581	0.493	0.490	0.495
Deviance	447.680	432.498	422.897	425.314
Notes: Respondents n = 178, Companies N = 42. Entries are estimation of the fixed effects with robust standard errors. Standard errors are in parentheses. [†] $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$				

4) Slope -as-outcomes model

H3 posits that collaborative culture moderates the relationship between openness and learning behavior, and H5 posits that organizational climate moderates this relationship. To examine H3 and H5, we examine the interactions between collaborative culture and learning behaviors, and between organizational climate and learning behaviors. We find that both variables are not significantly related to learning behaviors. Therefore, H3 and H5 are not supported. These results are shown in Figure 2.

Fig 2: Result model



7. Discussion

In this study, H1 is supported; openness was related positively to learning behavior. Matzler *et al.* [30] and Cabrera *et al.* [5] suggest that openness is associated with knowledge-sharing. The results of Major *et al.* [28] demonstrate that openness influences motivation to learn positively. These results are similar to support of our H1.

Yang [49] uses work group collaboration, immediate superior collaboration, and business unit collaboration to measure collaborative culture, which are related positively to knowledge-sharing. García-Morales *et al.* [12] proposed that CEOs should encourage collaboration because it is associated with organizational learning. These results are similar to the support we found for H2.

Xue *et al.* [47] examine the relationship between team climate and knowledge-sharing, and conclude that team climate influences knowledge-sharing behavior and attitude positively. Pham and Swierczek [33] demonstrate a supportive organizational climate facilitates the learning process, showing organizational learning and climate are linked closely. These results do not corroborate H4 in this study; we found that cooperative and warmth climate influences learning behavior, but is not the facilitator. We conclude that not all organizational climates are conducive for learning behavior.

Referring to the study of Slater and Narver [39], they suggest climate improves achievement. Cooperative climate involves a company possessing an understanding employee needs and a sense of security to support members [6]. Although collaborative culture and organizational climate were positive correlates of knowledge-sharing, explorative learning, and openness (Table 2), their interactions did not influence the relationship between openness and learning behavior; H3 and H5 were not supported.

Based on statement above, we present a summary of analysis results for the five hypotheses (Table 4) and show model results in Figure 2.

Table 4

Summary of analysis of hypotheses

<i>Hypothesis</i>	<i>Status</i>	<i>Effect</i>
H1. Openness is related to learning behavior	Supported	Sig.
H2. Collaborative culture is related to learning behavior	Supported	Sig.
H3. The relationship between openness and learning behavior is greater when a company has higher collaborative culture	Not supported	Not sig.
H4. Organizational climate is related to learning behavior	Supported	Sig.
H5. The relationship between openness and learning behavior is greater when a company has a higher organizational climate	Not supported	Not sig.

8. Conclusion and Implications

H4 was supported and the coefficient was negative. This result means that as organizational climate increases, learning behavior decreases. We found that cooperation and warm influence learning behavior negatively. The primary reason is that learning behavior includes explorative learning. Li *et al.* [23] described exploration as experimentation with new alternatives; they suggested that explorative learning causes negative consequences such as problem-solving inefficiently. The reason for these results is that more ideas related to high information loading lead to members who are difficult to coordinate, perhaps explaining results of H4.

Chen and Huang [6] propose a company has a cooperative climate, members are more likely to work together, share and develop tacit knowledge, and promote their performance and learning. Cooperation facilitates innovation ideas. Rhee [35] explained concepts in network ties. Weak ties provide new information and opportunities and is more likely to be innovative than strong ties; these are the cores of knowledge-sharing and explorative learning. Friendship ties are stronger than task-advice ties. Thus, a warm climate does not promote knowledge-sharing and explorative learning. Although a cooperative climate normally facilitates knowledge-sharing and explorative learning, a warm climate weakened them in this study. Therefore, the coefficient between organizational climate and learning behavior was negative, and H4 was supported. Based on the result of H4 and the studies discussed above, we conclude that not all kinds of organizational climate promote learning behavior. The results of this study demonstrate that support was received for H1 and H2. Both findings indicate that higher individual openness and organizational collaborative culture result in higher learning behavior.

H3 and H5 posited that both collaborative culture and organizational climate do not moderate openness to learning behavior. These results suggest that openness affects learning behavior, but organizational environment does not influence the relationship.

We use SCT to test the results of this study, asserting 3-way interaction among behavior, a personal factor, and environment. When we examine the correlation coefficients in Table 2, SCT is supported. Nevertheless, when examining the results of HLM, an interaction between the personal factor and environment does not exist, and only two relationships

were supported in SCT.

We investigated workers in technology companies and found some managerial implications from the results. First, the technology environment changes rapidly, so managers should encourage employees to share their experience, knowledge, information, and skills. Second, when managers recruit new members, they should test their personality traits, and pay attention to scores on individual openness. Third, technology companies need innovation continuously so they can perform explorative learning. Fourth, technology companies should encourage and develop a collaborative culture which can facilitate learning behavior. Fifth, not all organizational climates benefit to learning behavior. When technology companies use explorative learning, the climate tends to move toward task-advice ties to effect innovation and new information [35].

The primary limitation was difficult to find participants in Taiwan. Workers in technology companies have heavy workload; some workers did not have enough time to respond to the questionnaire and refused participation. Some workers missed one item, and HLM cannot handle missing data in a questionnaire, so self-selection bias may be generated.

In future research, researchers use different organizational climates to examine effects on learning behavior. In this study, collaborative culture and organizational climate did not moderate the relationship between openness and learning behavior. We propose exploring whether the two variables mediate openness and learning behavior. Additionally, we will collect more data from the technology industry since more data will support our research results and reduce bias.

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