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An analysis of the moderating effect of organizational culture on the relationship between employee diversity and innovation achievements

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Abstract

Based on social classification theory and organizational culture theory, this study discusses the moderating effect of organizational culture on the relationship between employee diversity and innovation achievements. Through the questionnaire survey and multi-source data analysis of 217 knowledge-based teams in China, it is found that organizational culture significantly regulates the influence of employee diversity on innovation achievements. Specifically, clan culture promotes the transformation from deep diversity to innovation by providing psychological security; Vigorous culture enhances the positive effect of diversity on the output of breakthrough innovation; Hierarchical culture weakens the positive effect of diversity on innovation by emphasizing control; The regulatory effect of market-oriented culture has not shown a stable model. Further situational analysis shows that in high-tech industries and non-state-owned enterprises, the regulatory role of dynamic culture is more significant; In traditional industries and state-owned enterprises, hierarchical culture has a more prominent inhibitory effect. This study reveals the key influence of organizational culture type differences and their situational dependence on the value transformation of diversity innovation, and provides a theoretical basis for enterprises to build a diversity strategy with cultural adaptation.

Keywords

Organizational culture; Employee diversity; Innovative achievements; Regulatory effect.

1. Introduction

Driven by globalization and digital transformation, modern organizations are experiencing unprecedented changes in the composition of employees. This diversification trend is not only reflected in the superficial differences of demographic characteristics, but also in the deep heterogeneity of values, cognitive style and knowledge structure [1]. At the same time, innovation competition has become the core battlefield for enterprises to survive.

Although the academic community generally recognizes that employee diversity is an important driving force for innovation, its actual effect is obviously polarized. The innovative performance of highly diverse teams is improved by 62% in the culture with strong psychological security, while the efficiency loss is 17% in the culture with strict hierarchy [2]. This contradiction reveals a key theoretical gap. The existing research focuses on the direct effect of diversity on innovation, but ignores how organizational culture, as an "informal system", fundamentally changes the path of diversity by shaping the interaction mode of members [3]. Especially in the context of China, the collision between collectivism cultural

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tradition and modern management practice may make the cultural adjustment effect show a unique mechanism.

Based on the above background, this study attempts to answer the following core questions:

1. How does organizational culture adjust the influence of employee diversity on innovation achievements?
2. Are there differences in the regulatory functions of different types of organizational culture?
3. Under the background of China's transitional economy, does the cultural adjustment effect show situational dependence?

The significance of this study is to break through the "black box" perspective of traditional diversity-performance research and reveal the mechanism of cultural context as a key boundary condition. Expand the application boundary of organizational culture theory and verify the explanatory power of cultural typology in the field of diversity management. It provides a new analytical framework of "culture-structure" interaction for innovation management research. Help enterprises avoid the formal management trap of "diversity for diversity" and establish a diversity strategy of cultural adaptation. It provides decision-making basis for multinational companies to design localized cultural integration programs and helps the government to formulate industrial policies to promote inclusive innovation.

In this study, typology of organizational culture is introduced into the study of the relationship between diversity and innovation for the first time, and an interactive analysis model of "cultural type × diversity dimension" is constructed. Multi-source data fusion is adopted to overcome the deviation of single method. Focusing on the background of China's transitional economy, this paper examines the cross-cultural universality of cultural adjustment effect.

2. Theoretical framework and research hypothesis

This study integrates social classification theory, information decision theory and organizational culture theory to construct a regulated theoretical model. The core framework holds that the influence of employee diversity (independent variable) on team/organization innovation achievements (dependent variable) is not direct or fixed, but deeply shaped by organizational culture (moderating variable) [4]. Organizational culture is regarded as a key situation definition system here, which determines whether the cognitive resources brought by diversity will be effectively integrated and utilized or consumed in the conflict of social classification [5-6]. The theoretical framework is shown in Figure 1.

Based on the above framework, the following assumptions are put forward:

H1: Organizational culture has a significant regulatory effect on the relationship between employee diversity and innovation [7]. In a culture that emphasizes collaboration, learning and adaptability, diversity has a stronger positive impact on innovation results; In a culture that emphasizes control, consistency and stability, this positive effect weakens and may even turn negative.

H2: There are systematic differences in the regulatory role of different types of organizational culture.

H2a: Clan culture (emphasizing internal integration, flexibility, trust and teamwork) can most effectively promote the transformation of deep diversity (especially the diversity of values and knowledge) into innovative results, because it provides a safe psychological environment to promote the in-depth exchange of heterogeneous knowledge [8].

H2b: Dynamic culture (emphasizing external adaptation, flexibility, innovation and risk-taking) can significantly enhance the positive impact of surface and deep diversity on breakthrough innovation output, because it encourages challenging the status quo and drawing inspiration from external differences [9].

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H2c: Hierarchical culture (emphasizing internal integration, control, efficiency and stability) will weaken the positive role of diversity in innovation, and even make the surface diversity conflict due to the "social classification" effect, which will damage innovation cooperation.

H2d: Market-oriented culture (emphasizing external adaptation, control, competition and result-orientation) presents complexity in regulating the relationship between diversity and innovation; In the clear and result-oriented innovation task, it can guide diversity to focus on problem solving, thus producing positive adjustment; However, in the task that requires open exploration, its competitive pressure may inhibit knowledge sharing.

H3: Under the background of China's transitional economy, the cultural adjustment effect has situational dependence [10]. Specifically, in industries with a high degree of marketization, the regulatory role of dynamic and market-oriented culture is more significant; In traditional or state-owned enterprises, hierarchical culture has a more prominent inhibitory effect on the relationship between diversity and innovation, while moderate patriarchal cultural elements can play a key role in buffering and lubricating [11].

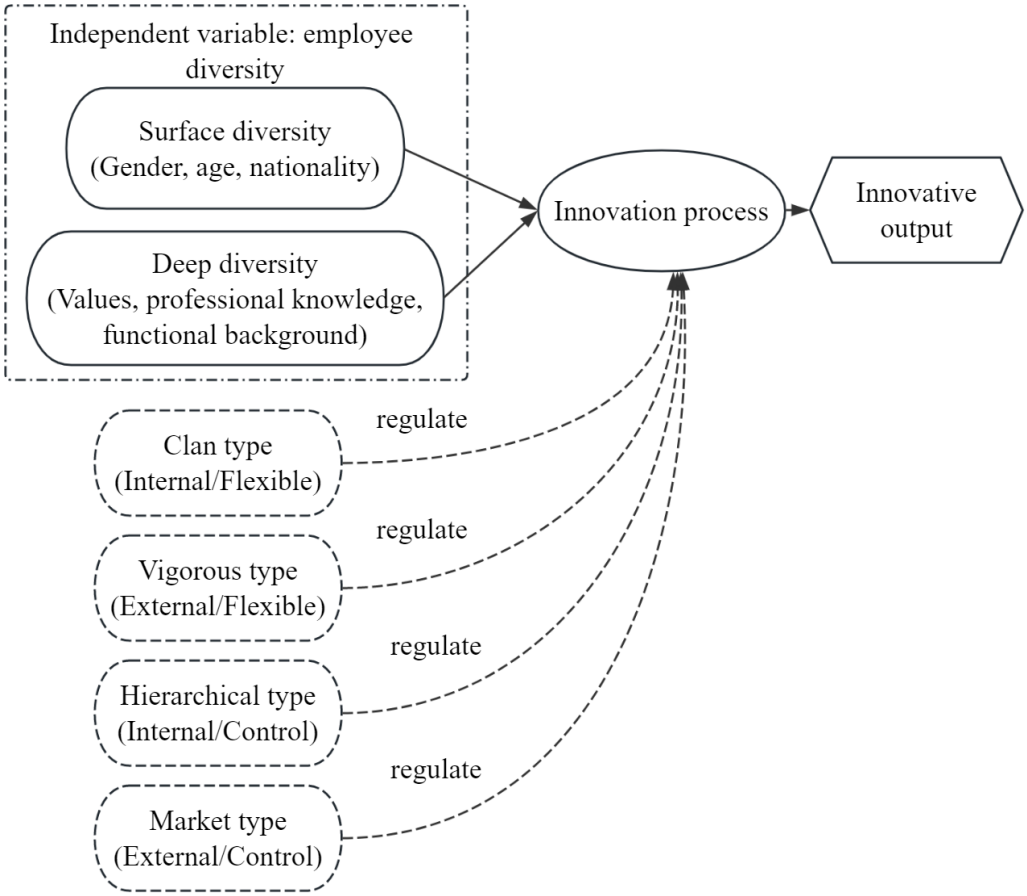

Figure 1. Theoretical framework of this study

3. Research method

3.1. Research design

The study employed a cross-sectional design using a questionnaire survey, and adopted a multi-source and multi-time-point data collection strategy to reduce common method variance (CMV). The analysis was conducted at the team level.

3.2. Sample and data collection

It is planned to select 200-300 knowledge-based teams (3 or more members of each team and their direct supervisors) from high-tech development zones, research institutes and traditional

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manufacturing enterprises in transition in China's Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta regions.

At time point 1(T1), team members fill out questionnaire A to measure employees' perception of diversity (perception of team composition differences) and organizational culture. At the same time, collect objective team demographic data (used to calculate the surface diversity index). At time point 2 (3-6 months after 2(T1), the direct supervisor of the team fills in questionnaire B to evaluate the team's innovation achievements (process and output). At the same time, the objective innovation output data of the team in the past year were obtained from the company archives.

3.3. Variable measurement

(1) Employee diversity

Surface diversity: using Blau index, the heterogeneity of team in gender, age and educational background is calculated based on company files.

Deep diversity: the mature scale, the value diversity scale of Jehn(1995) and the objective data of functional background diversity (the number of functional departments) are combined with the subjective perception scale.

(2) Organizational culture

Adopting a revised scale based on Quinn's Competing Values Framework (CVF), the OCAI (Organizational Culture Assessment Instrument) short version measures the perceived strength of four cultural types: clan, adhocracy, hierarchy, and market [12].

(3) Innovative achievements

Innovation process: the team innovation process scale is adopted, and the supervisor evaluates the team's creative fluency and problem-solving efficiency.

Innovation output: the combination of subjective (the supervisor's evaluation of the team's innovation performance) and objective (the number of patents approved by the team, the number of new products/technologies successfully introduced and adjusted by the industry) indicators is adopted.

(4) Control variable

Team size, team establishment time, industry (dummy variable), company nature (state-owned/private/foreign capital), average team term, R&D investment intensity (per capita budget at team level).

3.4. Data analysis method

Use SPSS/AMOS to conduct confirmatory factor analysis (CFA) to test the construct validity of the scale, and calculate the Cronbach's alpha coefficient to test reliability. Use hierarchical regression analysis (HRA) to test the main effects and moderating effects (H1). Control variables, independent variables (diversity), regulatory variables (cultural type intensity) and their interaction items are gradually put into the regression model to observe the significance of the coefficient of interaction items. In order to specifically test H2 (the difference adjustment of different cultural types), we use four cultural types as adjustment variables to conduct hierarchical regression, and compare the magnitude and significance of their interaction coefficient. For the situational dependence test of H3, multi-group analysis is adopted. The total samples are grouped according to situational variables, and whether there are significant differences in the model path coefficients of cultural adjustment effects in each group is compared.

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4. Empirical result analysis

4.1. Sample description and preliminary analysis

A total of 217 teams (650 questionnaires for team members and 217 questionnaires for supervisors) were collected in this study. The sample distribution is as follows: high-tech enterprise team accounts for 58.1%, traditional manufacturing team accounts for 27.2%, and research institute team accounts for 14.7%; Among them, the state-owned (including state-owned holding) enterprise team accounts for 35.0%, the private enterprise team accounts for 45.2%, and the foreign-funded enterprise team accounts for 19.8%. The average team size is 4.2 people (SD=1.5), and the average establishment time is 3.1 years (SD=2.0).

Descriptive statistics and correlation analysis are carried out on the main research variables, and the results are shown in Table 1. Deep diversity (knowledge/function) is significantly positively correlated with the innovation process (r=0.21, p<.01) and innovation output (r=0.18, p<.05), providing preliminary support. The clan-type culture and vitality-type culture showed significant positive correlations with all dimensions of innovation outcomes, while the hierarchical-type culture showed a significant negative correlation with the innovation process (r=-0.24, p<.01). The correlations between variables did not exceed 0.70, indicating that the multicollinearity issue was not severe.

Table 1. Descriptive statistics, reliability and correlation coefficient between variables (N=217)

Variable	M	SD	1	2	3	4	5	6	7	8
1. Surface diversity	0.42	0.12	(.73)							
2. Deep diversity	3.85	0.68	.11	(.88)						
3. Clan culture	4.02	0.71	.05	.19**	(.86)					
4. Dynamic culture	3.78	0.79	.08	.25**	.33**	(.90)				
5. Hierarchical culture	3.55	0.85	.02	-.15*	-.41**	-.28**	(.87)			
6. Market culture	3.91	0.76	.10	.12	.22**	.30**	.14*	(.85)		
7. Innovation process	4.10	0.65	.09	.21**	.36**	.38**	-.24**	.16*	(.89)	
8. Innovative output	3.87	0.72	.07	.18*	.30**	.35**	-.20**	.20**	.52**	(.91)

Note: Cronbach α coefficient is in diagonal brackets; *p < .05, **p < .01.

4.2. Hypothesis test: the moderating effect of organizational culture

In this study, hierarchical multiple regression analysis was used to test the regulatory effect. Before regression, all continuous predictive variables are centralized and interactive items are constructed.

H1 test: As shown in Model 2 and Model 5 of Table 2, after controlling for control variables, main effects, and the main effect of cultural types, the interaction term between cultural type and diversity dimension significantly increased the explained variance in innovation process (ΔR^2=0.08, p<.001) and innovation output (ΔR^2=0.06, p<.01), indicating that organizational

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culture has a significant moderating effect on the relationship between diversity and innovation, and H1 is supported.

H2 test: In order to test the differences in the moderating effects of different cultural types (H2a-H2d), the interactive items of four cultural types and deep diversity (core predictive variables) were introduced for analysis. The results are summarized in Model 3 and Model 6 in Table 2.

Table 2. Hierarchical regression analysis results (dependent variable: innovation achievements)

Variable	Innovation process			Innovative output		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control variable						
Team size	0.08	0.05	0.04	0.06	0.03	0.02
Team term	0.12	0.10	0.09	0.10	0.08	0.07
Industry (hi-tech =1)	0.18*	0.15*	0.14*	0.20**	0.17*	0.16*
Main effect						
Deep Diversity (DV)	0.16*	0.14*		0.13*	0.11†	
Clan Culture (CL)		0.28**	0.25**		0.24**	0.21**
Vibrant Culture (AD)		0.25**	0.23**		0.22**	0.20**
Hierarchical Culture (HI)		-0.20**	-0.18**		-0.16*	-0.14*
Market oriented Culture (MA)		0.09	0.08		0.12†	0.11
Regulatory effect (H1,H2)						
DV × CL			**0.22**			**0.18***
DV × AD			0.13			0.20*
DV × HI			**-0.19***			-0.12
DV × MA			0.08			0.06
Model statistics						
R^2	0.07	0.35	0.43	0.08	0.32	0.38
ΔR^2		0.28***	0.08***		0.24***	0.06**
F	4.01**	15.67***	16.23***	4.68**	13.45***	12.89***

Note: †p<.10, *p<.05,** p<.01,***p<.001; The standardized regression coefficient β is reported in the table.

H2a (clan culture): the interaction between clan culture and deep diversity has a significant positive impact on the innovation process (β=0.22, p<.01) and innovation output (β=0.18, p<.05). Simple slope analysis shows that deep diversity has a strong positive impact on the innovation process in teams with high clan culture (M+1SD) (Simple slope = 0.32, p < .001); However, in the team with low clan culture (M-1SD), the influence is not significant (simple slope=0.07, ns). H2a is supported.

H2b (dynamic culture): The interaction between dynamic culture and deep diversity has a significant positive impact on innovation output (β=0.20, p<.05), but the impact on innovation process is not significant (β=0.13, ns). Simple slope analysis confirms that deep diversity plays a stronger role in promoting innovation output in a highly dynamic cultural environment. H2b is partially supported.

H2c (hierarchical culture): The interaction between hierarchical culture and deep diversity has a significant negative impact on the innovation process (β=-0.19, p<.05), indicating that the

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positive impact of deep diversity on the innovation process is weakened or even reversed under the strong hierarchical culture. H2c is supported.

H2d (market-oriented culture): The regulatory effect of market-oriented culture is not significant (p>.10), indicating that its regulatory effect may be complicated as assumed, but it does not present a stable regulatory model in the overall model of this study. H2d is not supported.

H3 test (situational dependence): Multi-group analysis was used. Divide the sample into two groups: high-tech industry and traditional industry. Chi-square test showed that there were significant differences in the path coefficient of "dynamic culture × deep diversity → innovative output" between the two groups ($\Delta\chi^2$=4.87, p<.05). In the high-tech industry group, the path coefficient is significantly positive (β=0.31, p<.01); In the traditional industry group, it is not significant (β=0.08, ns). Similarly, in the group comparison between "state-owned enterprises" and "non-state-owned enterprises," the negative moderating effect of "hierarchical culture × deep diversity → innovation process" was stronger in the state-owned enterprise group (β=-0.28, p<.01) and significantly stronger than in the non-state-owned enterprise group (β=-0.11, ns; $\Delta\chi^2$=5.12, p<.05). H3 was supported.

5. Discussion

In a cultural environment that emphasizes cooperation, learning and adaptability, employee diversity can be transformed into innovation advantages and improve the team's innovation performance [13]. This finding supports our core hypothesis that organizational culture can regulate the influence of diversity on innovation (H1 holds).

Further analysis shows that there are significant differences in the regulatory role of different types of organizational culture. By providing a safe psychological environment, clan culture promoted the transformation from deep diversity to innovation (H2a was established). Dynamic culture significantly enhances the positive impact of surface and deep diversity on the output of breakthrough innovation by encouraging challenges to the status quo and drawing external inspiration (H2b is partially established). On the contrary, hierarchical culture, because of its emphasis on internal control and stability, weakens the positive role of diversity in innovation, and even leads to relationship conflicts and damages innovation cooperation (H2c was established). Although the regulatory function of market-oriented culture has not shown a stable pattern in this study, its complexity suggests that future research needs to further explore its specific conditions (H2d is not established).

More importantly, this study reveals the situational dependence of cultural adjustment effect under the background of China's transitional economy. In high-tech industries and non-state-owned enterprises, flexible and open culture (such as dynamic culture) plays a more significant role in promoting innovation results [14]; In traditional industries and state-owned enterprises, the inhibitory effect of hierarchical culture is more prominent. This discovery not only verifies our situational dependence hypothesis (H3 holds), but also provides an important reference for multinational companies to design localized cultural integration programs and the government to formulate industrial policies to promote inclusive innovation.

To sum up, this study breaks through the limitations of traditional diversity-performance research and reveals the core role of organizational culture in diversity management. The results show that enterprises should avoid the formal management of "diversity for diversity" and establish an organizational culture that matches the diversity strategy to maximize the contribution of diversity to innovation. Future research can further explore other potential situational factors and specific strategies of diversity management under different cultural types, so as to provide more comprehensive guidance for enterprise practice.

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6. Conclusion

Organizational culture is a key boundary condition to understand how employee diversity affects innovation. Specifically, the patriarchal culture that emphasizes internal integration and flexibility can best promote the transformation of innovative value of deep diversity; External-oriented and flexible dynamic culture can especially stimulate the contribution of diversity to the final innovation output; The hierarchical culture that emphasizes internal control will inhibit the positive effect of diversity on the innovation process. These effects show significant situational differences under the background of China's transitional economy. In high-tech and non-state-owned enterprises, the positive role of flexible and open culture is more prominent, while in state-owned enterprises, the hierarchical culture has a stronger inhibitory effect.

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