

The influence of innovative organisational management of technological and vocational schools on innovative performance - using organisational innovative climate as the mediator variable

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ABSTRACT: The purpose of this study is to apply organisational innovative climate as a mediator variable to explore the effects of innovative organisational management on the innovative performances of technological and vocational schools. Research results are provided as reference for schools to improve innovative management and performance. A questionnaire survey was given to teachers at technological and vocational schools in order to understand their views regarding innovative organisational management, innovative climate and innovative performance, and the effects of these factors. Research results show that innovative management does not influence innovative performance and the innovative climate factor is the primary factor influencing innovative performance. In innovative management, *performance orientation*, *professional orientation* and *innovative orientation* are important factors affecting innovative climate. In innovative climate, *innovation leadership* and *work autonomy* have a significant influence on innovative performance. In innovative management, *interpersonal orientation*, *performance orientation* and *innovative orientation* are important characteristics that affect innovative performance.

INTRODUCTION

When facing intense educational environments and a lower birth rate, technological and vocational schools must utilise limited resources in industrial-academic collaboration to promote the cultivation of technical talents, creative stimulation and teamwork consciousness, as well as enhance organisational creativity to improve management performance and to achieve sustainable management [1][2].

Innovative management is the strategy used by school organisations for product, process and service breakthroughs in changing current situations and developing unique characteristics to enhance organisational performance [3][4]. In organisational development, an innovative climate and psychological security, as well as innovation, are required to assist in the continuous elevation of innovative performance. An innovative climate relies on innovative behaviour, which is members' perception of their sense of identification and trust for the organisation through openness, engagement with challenges and support [1][3][5].

The innovative climate of school organisations affects the interactions and performances of their members. In order to satisfy the students' and parents' curricular demands, maintain internal competitiveness and enhance educational quality, schools have improved and adopted innovative strategies to manage the internal and external aspects of the organisation [6][7]. Organisations must continue to create new knowledge, which is comprehensively and broadly transmitted to all members of the organisation, who then quickly convert such knowledge into new technologies and products [8][9]. Thus, the purpose of this study is to explore the innovative management approaches for technological and vocational school organisations that affect innovative performance, and the mediator variables of a school organisation's innovative climate. Based on the motivations above, the research purposes are:

1. To explore the correlations between technological and vocational schools' innovative management, organisational innovative climate and innovative performance.
2. To verify the influential effects among the variables of technological and vocational schools' innovative management, innovative climate and innovative performance.

METHODS AND IMPLEMENTATION

This study treated teachers from technological and vocational schools as the population, and adopted random sampling and cluster sampling for the survey. There were 309 subjects, of which 163 taught at universities and 146 at vocational schools.

The research tool is the *Scale of effect on innovative performance in technological and vocational school organisational innovative management and innovative climate*. The compilation of this scale is based on the concepts of Amabile and Gryskiewicz, and refers to the Organisational Change Questionnaire-Climote of Change, Processes and Readiness (OCQ-C, P, R) scale by Bouckennooghe, Devos and Broeck; the organisational climate measurement developed by Patterson, West, Shackleton, Dawson, Lawthom, Maitlis, Robinson and Wallace; and the climate for innovation scale by King, Chemrmont, West, Dawson and Hebl for the compilation of this scale [2][8][10][11].

For this study, two experts evaluated the fitness of the questions to verify the expert fitness of scale. Six teachers from technological and vocational schools were invited to complete the questionnaire in order to enhance the content validity. Seven technological and vocational schools were selected for a pre-test, and the calculated factor and reliability referred to 150 teachers being used as pre-test subjects. A total of 129 valid questionnaires were collected; the valid return rate was 86%. The scale in this study was a self-report inventory, and was scored according to a five-point Likert scale, from 5 - *agree* to 1 - *disagree*. A higher score therefore indicated a higher level of agreement. The factor names, numbers of questions, and reliability levels of each aspect in this scale are as shown in Table 1.

The returned questionnaires were first coded, and the data were analysed using Statistical Package for Social Science (SPSS 10.0). Linear Structural Relations (LISREL) was used to verify the correlation and influential effects among the variables, such as *innovative management*, *innovative climate* and *innovative performance*, and achieve the 286 post-test teachers' research objectives. For the various statistical test levels in this study, Cronbach's $\alpha=0.05$.

Table 1: Chart of factors, numbers of questions and reliability levels of factors regarding the influence of technological and vocational school organisation innovative management and innovative climate on innovative performance.

Organisation innovative management scale			Organisational innovative climate scale			Organisation innovative performance scale		
Factor name	Number of questions	Cronbach α coefficient	Factor name	Number of questions	Cronbach α coefficient	Factor name	Number of questions	Cronbach α coefficient
Interpersonal orientation	4	0.78	Innovation culture	5	0.71	School affair development	4	0.81
Objective orientation	5	0.81	Innovation leadership	4	0.82	Innovative vision	5	0.87
Performance orientation	4	0.74	Work autonomy	4	0.77	Campus innovation	5	0.86
Professional orientation	4	0.62	Group cohesion	5	0.75	Innovative teaching	5	0.88
Innovation orientation	4	0.65						
Total reliability Cronbach α coefficient		0.85	Total reliability Cronbach α coefficient		0.86	Total reliability Cronbach α coefficient		0.93

RESULTS AND DISCUSSION

Direct Effects among Variables

In the influence model of innovative performance, the latent independent variable in this study was innovative management, while innovative climate and innovative performance were the latent dependent variables. According to the influential relationships hypothesised by this study, the data showed that the direct effect of innovative management on innovative performance was not significant (γ_{12} , $t=1.87$, $p>.05$), indicating that innovative management does not necessarily have a direct effect on innovative performance.

The direct effect of innovative management on innovative climate reached a significant level ($\gamma =0.47$, $t=4.99$, $p<0.05$), and the coefficient showed that the influential effect value reached 0.47. In terms of the effect of innovative climate on innovative performance, data indicated that the direct effect was significant ($\gamma =0.60$, $t=5.7$, $p<0.05$), with a value of 0.6. As seen, the influence on technological and vocational schools' innovative performance showed that innovative management has a significant direct influence on innovative climate, but not on innovative performance, while innovative climate has a significant direct influence on innovative performance [12].

Indirect Effects among Variables

In this research model, among the three latent variables, only innovative management had a significant indirect effect on innovative performance ($\gamma =0.28$, $t=5.7$, $p<0.05$). According to Figure 1, innovative management primarily acted indirectly through innovative climate to affect innovative performance; this indirect effect reaches 0.28.

Total Effect and Explained Variance among Variables

According to Table 2, innovative management had a direct effect on the innovative climate, but no indirect effect. The total effect value and direct effect value was 0.47, and the total effect of innovative management was 0.41, comprised of

0.13 direct effect and 0.28 indirect effect. Since the direct effect of innovative management on innovative performance did not reach a significant level, innovative management affected innovative performance indirectly through innovative climate. In particular, the total effect of innovative climate on innovative performance was equal to its direct effect, which means that in this model, teachers at technological and vocational schools believe that school organisational innovative climate would directly affect innovative performance. However, it would not exert an indirect influence through other variables [12][13].

Table 2: Total effect and significance test for each variable of the innovative performance influence model for technological and vocational schools.

Variable		Innovative management	Innovative performance
Innovative performance	effect value	0.41	
	standard error	0.07	
	t value	5.47	
	standardised effect value	0.41	
Innovative climate	effect value	0.47	0.60
	standard error	0.09	0.10
	t value	4.99	5.70
	standardised effect value	0.47	0.60

$p < .05$

Discussion

Innovative Management has an Overall Significant Correlation with Innovative Climate

Results of this study show that innovative management and innovative climate have an overall significant correlation. Under the aspect of innovative management, innovative climate is primarily affected by *performance orientation*, *professional orientation*, and *innovation orientation*, followed by *interpersonal orientation* and *objective orientation*.

The correlation and influence of innovative management on innovative climate are all positive, which shows that when factors in innovative management have a strong influence, there will be a higher sense of identification with the innovative climate. The reason is that characteristics such as *performance orientation*, *professional orientation* and *innovation orientation* in school innovative management have a greater degree of inclination toward innovation.

As a result, teachers have a higher perception of the innovative climate, and in turn, show a higher correlation to *work autonomy* and *group cohesion*. Thus, when school organisations have clear innovative management characteristics, there would be better leadership for the school's organisational innovative climate [2][3][6]. Therefore, the elevation of *performance orientation*, *professional orientation* and *innovation orientation* would enhance teachers' positive views about the organisational innovative climate of schools.

Innovative Climate and Innovative Performance have Significant Correlation and Influence

There is a significant correlation and influence between innovative climate and innovative performance, of which *innovation leadership* and *work autonomy* have the greater levels of correlation and influence on innovative performance. *Innovation culture* has a high level of correlation with *campus innovation*. Thus, it can be known that since teachers are more familiar with *innovation leadership* and *work autonomy*, there is a higher correlation with innovative performance and the influence is positive [3][5][7]. In other words, the greater the degree of identification with an innovative climate by teachers, the higher the innovative performance of the school.

Innovative Management

Innovative management does not have a direct correlation with or influence on innovative performance; however, it indirectly influences innovative performance through other mediator variables.

Results of this study show that innovative management does not have a direct correlation with, or an effect on, innovative performance, but that it acts indirectly through the mediator variable of *innovative climate* to affect innovative performance. Thus, the two factors of *performance orientation* and *innovation orientation* in innovative management have a significant effect on innovative climate.

Based on the above, it can be known that there are significant correlations between innovative management, innovative climate and innovative performance. Among these, factors such as *performance orientation*, *professional orientation*, and *innovation orientation* in innovative management; as well as *innovation culture*, *innovation leadership*, *work autonomy* and *group cohesion* of innovative climate, all show significant correlations with innovative performance [4][9][14][15]. Thus, improvements of innovative management by technological and vocational school organisations

are beneficial for teachers, by increasing their perceptions and sense of identification to the innovative climate, and enhancing the schools' innovative performance.

CONCLUSIONS AND RECOMMENDATIONS

Under innovative management, *performance orientation*, *professional orientation* and *innovative orientation* are important factors affecting *innovative climate*.

In terms of innovative performance, innovative management of technological and vocational schools involving *performance orientation*, *professional orientation* and *innovation orientation* have a greater influence on the leadership of an innovative climate. Thus, when innovative management approaches the previously mentioned three methods, there would be a greater sense of teacher identification and perception in response to an innovative climate.

Under innovative climate, *innovation leadership* and *work autonomy* have significant influence on the four factors under *innovative performance*; and *innovation culture* is more influential for *innovative campus*.

Innovation for technological and vocational schools, show that innovative climate and innovative performance are significantly correlated, under which *innovation leadership* and *work autonomy* have greater influence on *innovative performance*, while *innovation culture* has greater influence on *campus innovation*. According to the results, when teachers have a greater sense of an innovative climate, the school has better innovative performance.

Under innovative management, *interpersonal orientation*, *performance orientation* and *innovative orientation* are important characteristics that affect *innovative performance*.

According to the results, when the innovative management of a school has clear *interpersonal orientation*, *performance orientation* and *innovation orientation*, the school has a higher innovative performance. Conversely, schools that do not have such managerial approaches have lower *innovative performance*.

Teachers' *innovative management* and *innovative climate* can fit the *innovative performance* influence model and empirical data; however, the explanatory level is reduced.

The model used in this study falls below the ideal level of overall fitness. The absolute fitness used in the test is the worst, with only some indicators producing results close to the testing standards. The test on incremental fitness shows that most indicators conform to standards, and have better levels of fitness in the model for this study. Indicators for parsimonious fitness also conform to standards; parsimonious fitness is good. In the effect model, innovative management indirectly affects innovative performance through its innovative climate, which indicates that the extent to which teachers perceive innovative climate has a great affect on the innovative performance of schools.

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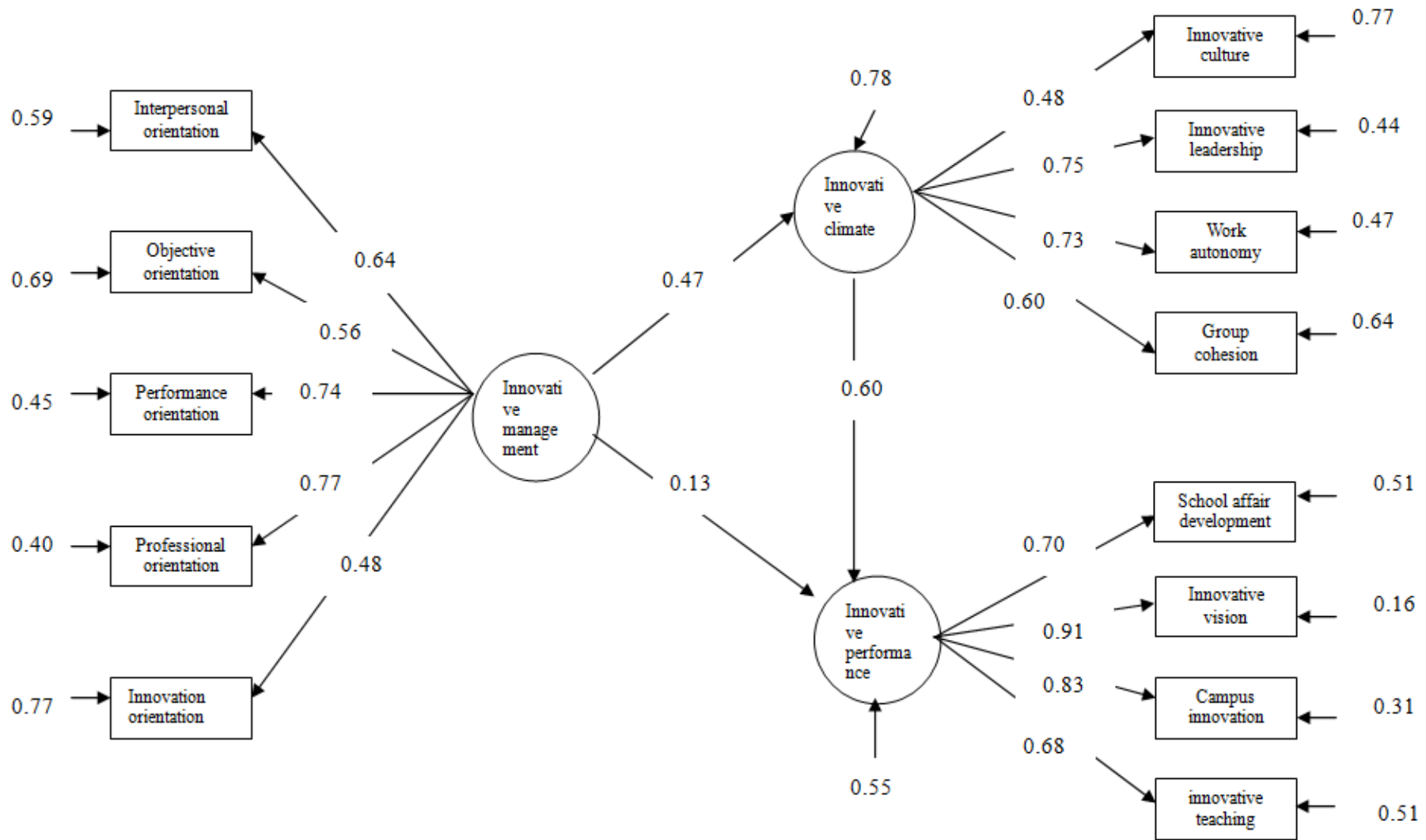


Figure 1: Paths in the effect model for organisational innovation management, innovation climate and innovative performance for technological and vocational schools.