An Empirical Study on the Promotion of Enterprise Technology Innovation by Vocational Education

Wenqiang Li[1,2], Hechun Wang[1,*], Xin Li[1]
[1]School of Management, Shenyang Normal University, Shenyang, Liaoning, China
[2]Shenyang Institute of Science and Technology, Shenyang, Liaoning, China
**Corresponding Author.*

Abstract: Based on the adaptation theory, this paper constructs an evaluation system for how vocational education promotes technological enhancement in enterprises from four aspects: talent training process, talent training quality, school-enterprise cooperation and enterprise technology improvement. Through correlation analysis and regression analysis, the paper establishes a demand-supply matching model for this evaluation system based on adaptation theory. This paper presents an empirical study of relevant data from six vocational colleges in Liaoning Province to examine how these colleges contribute to technological enhancement in enterprises. Research has shown that the three independent variables of talent cultivation process, talent cultivation quality, and school enterprise cooperation in vocational education have a significant impact on enterprise technological innovation and improvement. Based on the results, this paper discusses the findings and offers specific recommendations.

Keywords: Vocational Education; School-enterprise Cooperation; Enterprise Technology Enhancement

1. Introduction

With technological advancement and intensified market competition, enterprises must continually strengthen their technological innovation capabilities to maintain a leading position in the fierce market environment. The enhancement of technological innovation ability is the key to the sustainable development of enterprises. Technological innovation, as a primary driver of enterprise growth, is also a crucial factor in economic progress [1]. Therefore, enterprises should attach importance to technological innovation and continuously improve the ability of technological innovation. School-enterprise cooperation emerges as a vital pathway for nurturing talent in vocational education [2-3]. It holds significant strategic value for building a high-quality vocational education system. This paper adopts the empirical research method to construct an evaluation system for how vocational education promotes technological enhancement in enterprises. This system can foster technological innovation in enterprises and hold significant theoretical and practical implications for the intrinsic development of vocational education.

2. The Establishment of Evaluation Index System of Vocational Education Promoting Enterprise Technology Enhancement

According to the adaptation theory, the performance evaluation of the evaluation index of vocational education promoting enterprise technology improvement is carried out [4]. This research considers the needs and responsibilities in the collaboration between enterprises and vocational schools for promoting technological enhancement in enterprises through vocational education, the first-level indicators of the evaluation system include the talent training process, talent training quality, school-enterprise cooperation and enterprise technology innovation. The second-level indicators of the evaluation system cover the practicability of curriculum design, teachers' professional ability, teaching methods and means, students' skill mastery, learning effect tracking, practice and training base construction, curriculum and teaching material construction, information communication, training guidance, industry technology level improvement and patent output. The three-level indicators of the evaluation system are the fit between the course content and the industry demand, the

frequency of the course update iteration, and the students' satisfaction with the practicality of the course [5-6]. This framework ultimately establishes the first, second and third-level indicators for evaluating how vocational education promotes technological enhancement in enterprises, as shown in Table 1.

Table 1. Evaluation Index System of Vocational Education Promoting Enterprise Technological Innovation

first grade indexes	second index	third grade indexes	
talent cultivation process	Practicality of curriculum design	The fit of course content with industry needs	P1
		Frequency of course update iterations	P2
		Student satisfaction with the usefulness of the course	P3
	teachers' professional competence	The professional background of the teacher	P4
		Technical proficiency of teachers	P5
		The innovation of teachers' teaching methods	P6
		Teachers taking temporary positions in enterprises	P7
	teaching methods and ways	Diversity of teaching methods	P8
		Information-based teaching means	P9
talent training quality	Students' skill mastery	The passing rate of students on the skills test	P10
		The results of the evaluation of actual operational capability	P11
		Firms' satisfaction with students' skill levels	P12
	Learning effect tracking	Job security for graduates	P13
		Graduate promotion rate	P14
		Assessment of graduates' technical contributions to enterprises	P15
school-enterprise cooperation	the practice bases construction	School-enterprise co-construction experimental training base	P16
		School-enterprise cooperation training platform	P17
	Curriculum and textbook construction	Number of co-courses between vocational colleges and enterprises	P18
		Vocational colleges and enterprises jointly build teaching materials	P19
		The number of enterprise teaching materials introduced by vocational colleges	P20
	information communication	The number of university-enterprise cooperation academic seminars	P21
		Carry out school-enterprise cooperation project development, negotiation, information technology and other exchanges	P22
	training guidance	Vocational colleges and universities to track students' employment	P23
		Number of employees trained by vocational colleges for cooperative enterprises	P24
technological innovation	The technical level of the industry	The number of technological innovation projects	P25
		The economic benefits of technological innovation	P26
	patent output	Number of patents	P27
		Patent quality	P28
		Patent conversion rate	P29

3. Empirical Analysis

3.1 Data Collection and Sample Testing

3.1.1 Sample and effectiveness analysis

To design a questionnaire on how vocational education promotes technological enhancement in enterprises, the essay selected samples from six vocational colleges in Liaoning. The sample include students from different majors, enterprise supervisors, in-school teaching supervisor experts and

teacher representatives, ensuring the representativeness of the sample group. The questionnaire respondents are limited to mid-level or above managers to obtain accurate data on the talent needs required for technological innovation in enterprises.

A total of 400 questionnaires were distributed through field visits, field investigations, symposiums and online questionnaires, and 334 valid questionnaires were collected, achieving a response rate of 83.5%. The questionnaire uses a five-level Likert scale, where 1 represents the smallest talent support or need and 5 represents the greatest need.

3.1.2 Reliability test of scale

In this study, the SPSS 23.0 system was used for statistical analysis of the collected data. Reliability testing was conducted using Cronbach's Alpha to preliminarily explore and validate the evaluation indicators for vocational education promoting technological advancement in enterprises [7-8]. A reliability coefficient of 0.8 or higher indicates relatively good reliability for the test or scale; a reliability coefficient of 0.7 or higher is also acceptable. When the reliability coefficient exceeds 0.6, the scale should be adjusted accordingly, but the original values should be retained. If the reliability is below 0.6, the scale needs to be restructured. According to Table 2, the Cronbach's Alpha α coefficient for the first-level evaluation indicators of vocational education promoting enterprise technology improvement are 0.927, 0.954, 0.886, and 0.895 in sequence. Therefore, the items of the scale have relatively high reliability coefficient, indicating that the questionnaire has a high level of reliability.

3.1.3 Scale validity test

Validity test, also known as authenticity test, mainly aims to verify whether the questions in the questionnaire design process can accurately quantify the required information. This ensures the test results are highly accurate and authentic. The measurement data of KMO and Bartlett sphericity are shown in Table 3. The KMO value is 0.955, which exceeds the 0.7 threshold.

The questionnaire focuses on understanding the personnel training situation of vocational education promoting enterprise technology advancement, and the talent factors involved are based on the factor system of promoting enterprise technology advancement. Each evaluation indicator passed the significance test at the 5% level, signifying excellent validity.

In summary, the questionnaire exhibits high reliability and validity, making the data dependable and apt for further analysis.

3.2 Regression Analysis

Using multiple linear regression method [9], with enterprise technological innovation as the dependent variable and vocational education talent training process, talent training quality and school-enterprise cooperation as the independent variables. This method analyzes how vocational education promotes technological advancement in enterprises and establishes a regression equation model.

$$Y=\beta_1X_1+\beta_2X2+\beta_3X_3+\mu \quad (1)$$

In this equation, Y shows the technological innovation of enterprises, while X1 to X3 correspond to the talent training process of vocational education, the quality of talent training, and school-enterprise cooperation, respectively, and μ is a fixed value.

Multiple regression analysis was performed by SPSS 23 software. According to the data in Table 2 "Abstract of regression model of enterprise technological innovation", the R-square value of the multiple linear regression model is 0.841. This indicates that the three independent variables of "talent training process", "talent training quality", and "school-enterprise cooperation" explain 84.1% of the variance in the dependent variable.

This shows that the "technological innovation capability" of the dependent variable is largely affected by these three key factors. The fitness of this model is higher than the benchmark of 50%, demonstrating its strong predictive capability.

Table 2. Abstract of Regression Model of Enterprise Technological Innovation

model	R	R side	Adjusted R square	Error of standard estimation
1	.917[a]	.841	.838	.28890

a. prognosis variate: (constant), talent training process, talent training quality, school-enterprise cooperation

b. dependent variable: technological innovation

In the second step, the significance of the regression model is discussed. The multiple linear stepwise regression equation was established to analyze the impact of each

independent variable on the "enterprise technological innovation" model. This helps determine the regression coefficients and the extent of explanation.

The significance of the regression model lies in its applicability in reality, that is, whether the model can significantly affect actual operation. As shown in Table 3, the P-value is 0.000, which is less than 0.05, indicating that the model is significant. In other words, at least one independent variable in the model has a significant impact on the dependent variable enterprise technological innovation.

Table 3. Variance Analysis of Regression Model of Enterprise Technological Innovation

model	quadratic sum	degree of freedom	mean square	F	significance
regression	71.746	3	23.915	286.528	.000[b]
residual error	13.605	163	.083		
grand total	85.351	166			

a. dependent variable: technological innovation

b. prognosis variate: (constant), talent training process, talent training quality, school-enterprise cooperation

In the third stage of the study, the influence of various factors on the "enterprise technological innovation" of the program is discussed. By examining the "Coefficient of regression equation of enterprise technological innovation" in Table 4, it is found that the talent training process has a significant impact on the technological innovation of the model enterprise, with a significance level of 0.002 < 0.05 and a regression coefficient of 0.218 > 0. Strengthening the talent training process will directly promote the improvement of technological innovation of model enterprises. For every unit increase, technological innovation in enterprises will increase by 0.218. The significance level of talent training quality is 0.005 < 0.05, indicating a significant positive impact on technological innovation in enterprises. A one-unit increase in talent training quality will result in a 0.095 increase in technological innovation. School-enterprise cooperation will directly improve the technological innovation of model enterprises. The significance value of school-enterprise cooperation is 0.000, which is less than 0.05, and the regression coefficient is 0.658, greater than 0. The improvement of school-enterprise cooperation will bring obvious positive impact.

In the fourth stage, it is necessary to confirm whether there is multicollinearity between the independent variables. The relationships between vocational education talent training process, talent training quality and school-enterprise cooperation are studied. By examining the "coefficient table", it was found that the VIF values for the three independent variables are all below 5, indicating no multicollinearity among the independent variables. This verifies the accuracy and stability of the regression model used in the study.

Table 4. Coefficient of Regression Equation of Enterprise Technological Innovation

model		Non-standardized coefficient		standardized coefficient	t	significance	Colinearity statistics	
		B	standard error	Beta			allowance	VIF
1	(constant)	.177	.144		1.228	.221		
	talent cultivation process	.218	.094	.208	2.315	.002	.121	3.275
	talent training quality	.095	.098	.089	.966	.005	.116	2.646
	school-enterprise cooperation	.658	.065	.650	10.071	.000	.234	4.266
a. dependent variable: technological innovation								

3.3 An Empirical Analysis of Vocational Education Promoting Enterprise Technology Improvement

3.3.1 The influence of the vocational education talent training process on the improvement of enterprise technology

Vocational colleges play an important role in the process of training a large number of high-quality skilled talents for the society. Vocational colleges cultivate the technical talents needed by enterprises, stimulate their innovation potential, and thereby promote the continuous innovation of enterprise technology.

Vocational colleges put forward teaching reform plans that meet the needs of enterprises. The application of information technology in the teaching of vocational colleges can not only improve the teaching effect, but also enhance the learning ability of students, and help students better understand and master various knowledge and skills [10]. The teaching methods of vocational colleges emphasize practical operation, focusing on the cultivation of students' practical skills and the cultivation of teamwork spirit.

3.3.2 The influence of the vocational education talent training quality on the improvement of enterprise technology

Students' mastery of skills not only affects their future work performance, but also affects the technological innovation of enterprises. Analyzing the problems in vocational skills training in vocational schools reveals that students with a solid foundation in technical skills are more likely to propose innovative solutions in the workplace and promote technological improvement. When the students of vocational education can master the skills related to the technological transformation of enterprises, they can better adapt to the technical needs of enterprises, so as to directly bring technological improvement to enterprises. Tracking the learning effect can help vocational colleges find the shortcomings and problems of students in mastering skills, put forward suggestions for improvement in time, and improve teaching in a targeted way.

3.3.3 The influence of school-enterprise cooperation in vocational education on the improvement of enterprise technology

Internship and training bases created through school-enterprise cooperation allow students to directly participate in the daily work of enterprises, rapidly improving their practical skills. Research and analysis of the practical teaching process show that school-enterprise cooperation is an important guarantee for achieving talent cultivation goals in vocational schools. The school manages the practice training process to make it standardized and institutionalized. Through internship and practical training, students can have access to the latest technology and equipment of enterprises, thereby mastering advanced technical knowledge and experience, which is conducive to the inheritance and innovation of enterprise technology.

4. Conclusion and Management Enlightenment

Vocational education is an important way to cultivate talents and promote technological innovation in enterprises. Through vocational education, talents can be trained to cultivate the technical skills needed by enterprises, stimulating their innovation potential to promote continuous innovation of enterprise technology. Vocational education occupies an important position in cultivating high-quality skilled talents. The development of vocational education should be guided by the optimization and upgrading of industrial structure, with the purpose of enhancing the core competitiveness of enterprises and promoting technological innovation.

Based on the above research conclusions, the following management implications are proposed: The first is to strengthen the talent cultivation process in vocational education. Increase practical teaching methods, allowing students to learn and master skills in real operational environments. Improve the practicability of course design, adjust and optimize course design according to market demand and industry development trends, and ensure that professional education and industry development are closely combined. Improve the professional quality of teachers, strengthen the construction of vocational education teachers, improve professional knowledge and practical ability. The second is to improve the quality of talent training. Adjust and optimize courses to ensure that course content closely aligns with professional demands based on market needs and industry development trends. The third is to strengthen the cooperation between schools and enterprises, establish internship and training bases. Create robust internship environments, clarifying the responsibilities and relationships between schools and enterprises, and promoting deeper cooperation. Enhance communication and exchange between schools and enterprises to promptly understand the needs and challenges of vocational schools and enterprises, and jointly explore solutions.

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