The Digital Intelligent Cultivation of Cross-border E-commerce Talents based on the Benchmark Regression Model

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Abstract—With the expansion of the popularity of digital intelligent, cross-border e-commerce talent training process is affected by many factors. The influence of these factors on the training of cross-border e-commerce talents under the digital intelligent enabling system is sustainable and complex. In order to clarify the influencing process of relevant factors, we conducted research by literature review, correlation test, common method bias test and benchmark regression method. The results are as follows: (1) Students' autonomous online learning efficiency, teachers' classroom digital intelligent teaching ability, digital intelligent teaching scenarios, and digital intelligent teaching management level are all important factors that sustainably affect the training of cross-border e-commerce talents. (2) The positive development of these influencing factors could sustainably promote the improvement of cross-border e-commerce talent training quality. (3) The degree of sustainability impact on the quality of cross-border e-commerce talent training, in order from strong to weak, is digital intelligent teaching scenario, students' autonomous online learning efficiency, teachers' classroom digital intelligent teaching ability, digital intelligent teaching management level.

1. Introduction

According to the data released by China's Ministry of Commerce, China's cross-border e-commerce trade volume reached 21,000 yuan in 2022, an increase of 7.1% year-on-year. In this context, the scale of cross-border e-commerce demand is also expanding. According to China's National Bureau of Statistics, there is a shortage of nearly 4.5 million cross-border e-commerce workers in China, and it is growing at 30% a year. It shows that there are many problems in the training of cross-border e-commerce talents in China, which couldn't meet the needs of the relevant talent market. At the same time, the 20th National Congress of the Communist Party of China made major decisions and deployments on adhering to the priority of education development and accelerating the construction of an education powerhouse, emphasizing the promotion of digitization of education. In 2023, the China Education Work Conference also takes "the strategic action of promoting education digital intelligent in depth" as the future main direction. The "Teacher Digital Literacy" education industry standard formulated by the Ministry of Education is divided into 5 1st-level dimensions, 13 2nd-level dimensions and 33 3rd-level dimensions. The standard clarifies the National Strategy Action Plan for Digitalize of Education to sustainably increase teachers' awareness, capacity and responsibility to use digital technologies to innovate and transform educational and teaching activities. At the same time, the formation of a new round of global industry and trade pattern has prompted China's development concept to change from scale growth to quality improvement and sustainable development. It requires a deep and sustainable integration of digital tools and talent training processes to meet the realistic needs of high-quality and multi-path development of society. Therefore, combined with digital intelligent enabling, we deeply analyze the sustainable training of comprehensive talents in cross-border e-commerce. It is hoped that through the study, the training efficiency of Chinese cross-border e-commerce could be sustainably improved by means of digital intelligence.

The marginal contributions of this study are as follows: (1) This study extends the research content of talent training. In previous studies, few scholars combined numerical intelligence empowerment with talent training. However, we combine the research of talent training with digital intelligence empowerment to enrich the research content of talent training. (2) This study expands the application scenarios of the benchmark regression method. In the past, scholars seldom used benchmark regression to study cross-border e-commerce talent training. However, we use this method to analyze the influencing factors of cross-border e-commerce talent training. Therefore, we effectively expand the application scenarios of the benchmark regression method. (3) The conclusions of this study provide important references for the relevant subjects of cross-border e-commerce talent training. Combined with the correlation analysis, we get very important conclusions. These conclusions provide important references for the daily work of cross-border e-

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commerce training institutions, teachers and relevant managers.

The cultivation of cross-border e-commerce talent is a long-term and dynamic process. With the continuous expansion of the influence of digital intelligence enabling, the influence factors of cross-border e-commerce talent under digital intelligence enabling are increasing.

(1)Efficiency of students' autonomous online learning. In the process of training cross-border e-commerce merchants enabled by digital intelligence, the proportion of learning time spent on online teaching and virtual simulation will increase significantly. Therefore, the efficiency of students' autonomous online learning will affect the effect of related teaching to a large extent.

(2) Teachers' ability to teach numerically in class. The level of teachers' digital intelligent teaching ability in the classroom will affect the quality of cross-border e-commerce talent training to a large extent.

(3) Number intelligent teaching scene. It is relatively high for cross-border e-commerce merchants to cultivate log-intelligent teaching scenarios under the ability of digital intelligentization. The design and implementation of these digital intelligent teaching scenes will affect the training effect of cross-border e-commerce merchants under digital intelligent enabling.

(4)The management level of mathematical intelligence teaching. The training quality of cross-border e-commerce merchants will also be significantly influenced by the level of digital intelligent teaching management. The digital intelligent teaching management here includes teaching process supervision, teaching effect tracking evaluation, teaching result feedback, teaching method supervision and so on.

2. Empirical analysis

2.1 Variables

Based on relevant theories and literature review, we determined the explained variables and explanatory variables of this study. All evaluation indicators are shown in Table 1. The explained variable is cross-border e-commerce talent training quality (TCQ). Explanatory variables are as follows: student autonomous online learning Efficiency (SSE), teacher classroom digital intelligent teaching ability (CTA), digital intelligent teaching scenarios(DTS), digital intelligent teaching management level (DML). At the same time, the control variables of this study are as follows: cross-border e-commerce industry policy (ICP), cross-border e-commerce trade scale (ICS) and macroeconomic environment and economic level (MEL).

Table 1. Variable and indexes

Variables		Indexes	Direction	References
Explained variable	TCQ	Students could pass the assessment of all cross-border e-commerce courses	Positive	Green[1]
		Students could meet the needs of cross-border e-commerce enterprises	Positive	
		Students could operate shops on cross-border e-commerce platforms	Positive	
Explanatory variables	SSE	Students could complete the content of online learning by themselves	Positive	Zheng[2]
		Students could complete online homework independently and with high quality	Positive	
		Students are satisfied with online learning	Positive	
	CTA	Teachers could skillfully use digital intelligent teaching equipment	Positive	Cheng[3]
		Teachers could carry out digital intelligent teaching	Positive	
		Teachers are proficient in using digital intelligent teaching methods	Positive	
	DTS	Digital intelligent teaching scene is diversified	Positive	Li[4]
		Digital intelligent teaching scenario improves teaching efficiency	Positive	
		Digital intelligent teaching scenarios appeal to students	Positive	
	DML	Digital intelligent teaching managers have strong management ability	Positive	Guo[5]
		Digital intelligent teaching management process is comprehensive	Positive	
		Digital intelligent teaching management results feedback is timely	Positive	

2.2 Questionnaire survey

Before the formal large-scale survey, in order to ensure the scientific and accuracy of the survey questionnaire, we first distributed 30 questionnaires in a small range. We analyzed the respondents' answers, eliminated invalid questions, and finally determined the final questionnaire for this study. In addition, we used 5-level Likert scale to measure each variable index. The questionnaire distribution methods in this study include face-to-face,

email, Wechat mini program, telephone survey and so on. Moreover, in terms of the selection of survey objects, we chose universities that have opened cross-border e-commerce courses or majors. In order to strengthen the comprehensive coverage of this survey questionnaire, 20 universities were selected for this formal survey. Most of the surveyed universities train no less than 100 cross-border e-commerce students every year. The respondents included cross-border e-commerce students, teachers, administrative personnel and some cross-border e-commerce enterprises' staff. In addition, the universities surveyed are mainly from Hangzhou, Guangzhou, Shenzhen, Shanghai, Nanjing, Beijing, and Harbin.

In this survey, we issued a total of 835 questionnaires and recovered 807 questionnaires. We excluded invalid questionnaires and obtained 772 valid questionnaires. Therefore, the effective rate of questionnaire recovery in this survey was 92.46%.

2.3 Reliability and validity test

We used SPSS statistical software to obtain the reliability test and validity test results of the scale, as shown in Table 2. According to the reliability test results, the α coefficients of index variables in this survey scale are all greater than 0.817. It indicates that the scale design reliability of variables SSE, CTA, DTS, DML and TCQ in this study is high. At the same time, the combined reliability (CR) values of the scale variables are all greater than 0.927. It indicates that the overall reliability of the questionnaire scale in this study is good.

At the same time, we used Bartlett sphericity test and KMO test to obtain the KMO results of SSE, CTA, DTS, DML and TCQ of 0.936, 0.972, 0.928 and 0.904, respectively. These values are all greater than 0.903. In addition, the Bartlett sphericity test results of SSE, CTA, DTS, DML and TCQ are all 0.000, significantly less than 0.05. It indicates that the survey scale of this study could be used for further analysis and research.

Validity test. According to the validity test results, the factor load of each variable item in this survey is greater than 0.7. It shows that the structure validity of this scale is good. At the same time, the average extraction variance (AVE) of each variable in this scale is greater than 0.617. It shows that the convergence validity of this scale is also good.

To sum up, the survey scale in this study passed the validity test and reliability test. Therefore, we could use this scale for the follow-up research.

Table 2. The test results of scale reliability and validity

Variables	Factor loading					AVE	α	CR
	1	2	3	4	5			
SSE	0.738	0.803	0.763	0.783	0.883	0.633	0.817	0.927
CTA	0.725	0.814	0.759	0.719	0.829	0.617	0.943	0.945
DTS	0.749	0.855	0.822	0.803	0.794	0.629	0.918	0.961
DML	0.751	0.892	0.851	0.854	0.718	0.635	0.909	0.958
TCQ	0.799	0.801	0.803	0.791	0.703	0.674	0.942	0.931

2.4 Correlation test

In order to further strengthen the accuracy of this study, we used SPSS software to conduct correlation test on survey scale data. The correlation test results of specific variables are shown in Table 3. First of all, the difference between the mean and standard deviation of variables in this study is relatively small. Therefore, we can determine that there is no heteroscedasticity between the variables in this study. Secondly, the value of the phase relation between each variable is significantly less than the value of the square root of AVE. It shows that the differential validity of the scale in this study is good. Finally, SSE, CTA, DTS and DML are positively correlated with TCQ. The correlation test results are consistent with the theoretical analysis of this study.

Table 3. Correlation test of variables

Variables	Mean value	Standard deviation	SSE	CTA	DTS	DML	TCQ
SSE	3.725	0.633	0.779				
CTA	3.731	0.642	0.422**	0.742			
DTS	3.762	0.671	0.463**	0.439**	0.736		
DML	3.719	0.649	0.508**	0.517**	0.623**	0.749	
TCQ	3.774	0.639	0.372**	0.428**	0.431**	0.558**	0.762

Note: ** represents significant at the 5% level. The diagonal data is the square root of the variable AVE.

2.5 Common method deviation test

We conduct a common method deviation test. Harman single factor test is used in this study. First, we conducted an exploratory factor analysis study on 15 items of SSE, CTA, DTS, DML and TCQ variables. Furthermore, principal components with eigenvalues greater than 1 are extracted. The explanation ratio of the variance of the first common factor is 37.162%. This value is significantly 40% below the critical standard value.

The result shows that there is no serious common method bias in the data of this scale. Thus, the scale in this study passed the common method bias test. We could continue to use the scale data for subsequent benchmark regression analysis.

2.6 Benchmark regression analysis

The results of benchmark regression analysis are shown in Table 4. The results of Hausman test indicate that the fixed effect model in this study has a good effect. Model (1) represents the regression results of the influence of SSE, CTA, DTS and DML on TCQ in the absence of control variables.

Model (2) represents the regression results of the influence of SSE, CTA, DTS and DML on TCQ when control variables are added. The regression results show that SSE, CTA, DTS and DML all pass the significance test on the positive effects of TCQ. At the same time, SSE, CTA, DTS and DML show a positive promoting effect on TCQ. According to the impact degree, the ranking from strong to weak is DTS, SSE, CTA and DML.

Table 4. Benchmark regression results

Variables	(1)	(2)
LnSSE	0.0625** (9.72)	0.0668** (9.73)
LnCTA	0.0427** (4.09)	0.0552** (3.88)
LnDTS	0.0828** (3.66)	0.0792** (4.75)
LnDML	0.0571** (4.22)	0.0392** (5.08)
LnICP		0.0253*** (0.41)
LnICS		0.0508** (2.77)
LnMEL		0.0692** (3.89)
Con_	-5.7369** (-72.93)	3.558** (15.92)
Hausman	638.29*** (0.00)	739.22** (0.00)
R^2	0.3722	0.3980
N	11580	11580

Note: ** and *** represent significant at 5% and 1% levels respectively.

3. Conclusions and implications

3.1 Conclusions

(1) There are many factors that sustainably affect the quality of cross-border e-commerce talent training. Under the Digital intelligent enabling system, the training process of cross-border e-commerce merchants has been continuously affected by many factors. These factors include students' autonomous online learning efficiency, teachers' digital intelligent teaching ability in the classroom, digital intelligent teaching scenarios, and digital intelligent teaching management level. These influencing factors all affect the training process of cross-border e-commerce merchants under the digital intelligent enabling system from a dynamic perspective.

(2) All relevant factors have a positive and sustainable impact on the quality of cross-border e-commerce training under digital intelligent enabling. Students' autonomous online learning efficiency, teachers' classroom digital intelligent teaching ability, digital intelligent teaching scenarios, and digital intelligent teaching management level all sustainably affect the training process of cross-border e-commerce merchants from a positive perspective. In other words, the positive development of these factors could promote the improvement of the quality of cross-border e-commerce talent training to a greater extent. On the contrary, if there is a negative development of these factors, it would significantly inhibit the improvement of cross-border e-commerce training quality.

(3) There are great differences in the degree of influence of relevant factors on the talent training of cross-border e-commerce. Judging from the impact of these factors on the quality of cross-border e-commerce talent training, there is a large difference. The degree of influence from strong to weak is digital intelligent teaching scene, students' autonomous online learning efficiency, teachers' classroom digital intelligent teaching ability, digital intelligent teaching management level. Among them, the digital intelligent teaching scenarios and students' autonomous online learning efficiency are the 2 most important influencing factors.

Moreover, when designing cross-border e-commerce courses, teachers must build effective digital intelligent teaching scenes and improve the monitoring mechanism for students' autonomous learning. The school would fully integrate the elements of digital intelligence into the cross-border e-commerce course, which could effectively optimize the teaching process. Furthermore, relevant teachers and administrators need to learn a variety of things to effectively implement digital intelligent teaching. Relevant personnel could go to high level schools, or participate in some training activities. In this way, the teaching efficiency of digital intelligent cross-border e-commerce could be improved as a whole.

3.2 Research deficiencies and future research directions

Due to the limitations of the author's time and ability, the deficiencies still exist in this study are as follows: (1) We only studied the influencing factors of the training process of cross-border e-commerce merchants from the perspective of digital intelligent enabling, but did not study the training process of cross-border e-commerce merchants from other perspectives. In future research, the perspective of professional cluster, new liberal arts and double cycle could be added. (2) We only studied the factors affecting the training process of cross-border e-commerce merchants, but did not study the obstacles and paths of relevant talent training. In the future research, we will continue to improve the relevant research content.

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