



Research on the Influencing Factors of Specialty Identity of Blockchain Technology Application in Higher Vocational Colleges Based on Structural Equation Modeling

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Abstract. This study constructed a model of blockchain specialty identity using structural equation modelling by randomly sampling students from a higher vocational college and analyzed the role relationship and influence effect of each element in the model. The findings show that specialty emotion, specialty behavior, specialty goal, and specialty awareness all have a direct positive influence on blockchain specialty identity. Among these factors, specialty behavior has the greatest influence, followed by specialty emotion. Therefore, this study verifies the conclusions of scholar BrickSon's research related to college students' specialty identity and provides a theoretical basis for the construction and talent cultivation of blockchain technology application majors.

Keywords: structural equation modelling; blockchain; higher vocational colleges; specialty identity.

1 Introduction

Specialty identity is an expression of the degree to which students understand, accept, and identify with the field of study. It encompasses an individual's identification with professional knowledge, skills, and values, and is a perception of professional characteristics and career development. Specialty identity has a significant impact on an individual's professional learning, career development and work performance [1].

Blockchain technology is a new distributed infrastructure and computing method. It utilizes blockchain data structure to verify and store data, generates and updates data through distributed node consensus algorithms, cryptographically secures data transmission and access, and also manipulates data through smart contracts consisting of automated scripting code [2].

In recent years, global blockchain technology has been booming, and related industry applications have gradually landed and grown rapidly, with an increasing demand for related talents. According to the new version of the catalogue of majors issued by

blockchain engineering has been added to the undergraduate degree, and the major of blockchain technology application has been added to the specialist degree. [3] However, as of April 2023, only 29 general undergraduate colleges and universities nationwide have successfully filed blockchain engineering majors [4][5][6], while 31 blockchain technology application majors have been filed in specialized vocational colleges and universities [7]. In the United States, Higher Education Institutions (HEIs) have also highlighted the increased demand for blockchain application talents, further highlighting the importance and urgency of setting up blockchain majors in higher education institutions. It can be seen that both domestic and foreign countries are at the stage of initial exploration and start-up in the cultivation of blockchain talents [8].

Considering the development of this emerging profession, this study takes the students enrolled in the blockchain technology application major of Hubei Science and Technology Vocational College as an example to explore the current situation of the specialty identity of the students in this major and to study in depth the main factors affecting the students' specialty identity. Through targeted research, we can improve the educational quality of blockchain technology application major, cultivate students' sense of identity for the major, and build a high-quality parenting system that meets the talent standards of the new era. Based on this, this paper refers to scholars' related research on blockchain professional education, creates a questionnaire on the identity of blockchain technology application profession in colleges and universities, obtains data through students' self-evaluation, analyses students' data, and applies structural equation modeling to model and analyze the questionnaire data to explore the influencing factors of the identity of blockchain technology application profession. This research will provide a theoretical basis for the construction of blockchain technology and talent cultivation in emerging professions. By constructing a model of blockchain technology application specialty identity and applying structural equation modelling techniques to analyze the mechanism of influencing factors in depth, it will provide a comprehensive reference for blockchain professional teaching.

2 Construction of the Research Model

Structural Equation Modeling, or SEM for short, is a statistical method based on the covariance matrix of variables used to analyze relationships between variables. This method has been widely used in the field of education, psychology, sociology, and other social sciences research. The definition given by Ullman in 1996: "A multivariate analytical procedure for verifying a set of interrelationships between one or more independent variables and one or more dependent variables, where the independent variables and the dependent variable can be either continuous or discrete", this definition highlights the importance of SEM. " [9], this definition highlights the characteristics of SEM to verify the relationship between multiple independent variables and multiple dependent variables.

In order to construct the research model, this paper adopts the Specialty Identity Scale compiled by Brickson [10] as the basis and modifies it with the actual situation of the profession. Taking the four dimensions of specialty emotion, specialty behavior,

specialty goal and specialty awareness as the influencing factors of professional students' sense of identity, the theoretical model of the influencing factors of specialty identity is constructed (as shown in Fig. 1), and the relevant research hypotheses are also put forward.

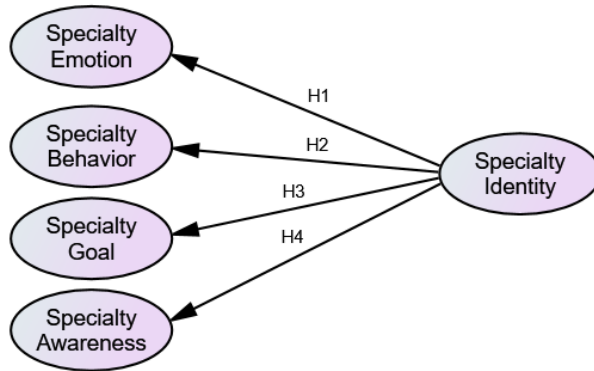


Fig. 1. Hypothetical model of factors influencing specialty identity in blockchain technology application.

In the model construction, specialty emotion, specialty behavior, specialty goal and specialty awareness are taken as independent variables, while specialty identity is the dependent variable we focus on. The model is used to gain insight into the effects of these four dimensions on specialty identity and to validate the relationship between them. This study will provide an important theoretical basis for understanding students' identification with the profession of blockchain technology application.

2.1 Specialty Emotion

Specialty emotion refer to the emotional experiences that emerge from students' learning and professional fields, including enthusiasm for learning, interest, and creativity. Emotion serves as an important driver of human emotion and behavior, and this is especially true for blockchain technology application students. Positive emotion can motivate students to be more focused on learning, to dare to face problems, and to develop excellent creativity and cooperation skills. These emotions can not only influence their academic performance but will also profoundly affect their future career choices.

Hypothesis H1: Specialty Emotion directly affect specialty identity.

2.2 Specialty Behavior

Specialty behavior refers to the behaviors and mannerisms of students related to the profession they are studying that they exhibit during the course of their studies and career development. It encompasses students' attitudes towards their majors, professionalism, ethics, and self-management. Positive specialty behavior not only help

students to succeed in their studies, but also lay a good foundation for their future career development.

Hypothesis H2: Specialty behavior directly affects specialty identity.

2.3 Specialty Goal

A specialty goal is a career or academic direction set by a student during the course of study that is relevant to the major being studied. It contains employment goals, professional certification goals, entrepreneurial goals, and further study goals. It reflects students' expectation and pursuit of their future development. Clearly defined specialty goal help college students plan their academic and career more purposefully.

Hypothesis H3: Specialty goal directly affect specialty identity.

2.4 Specialty Awareness

Specialty awareness refers to the cognitive ability of students in terms of understanding, knowledge structure and disciplinary thinking of the specialty they study. It includes the understanding of the depth of knowledge, disciplinary background, and related concepts in the professional field, as well as the cognition of professional development trend and problem-solving methods. Specialty awareness is the ability of college students to apply knowledge and ways of thinking in the professional field. It helps students to better understand and apply the professional knowledge they have learnt, and also develops the ability to solve practical problems and continuous learning.

Hypothesis H4: Specialty awareness directly affects specialty identity.

3 Research Design

3.1 Research Subjects

This study was conducted on 27 December 2023 by selecting students from the first to the third year of the university majoring in blockchain technology application in Hubei Institute of Science and Technology Vocational College as the research subjects. The questionnaire information was collected anonymously by sending the QR code and address link generated by the questionnaire platform within the student group. To ensure the accuracy and completeness of the data, each question of the questionnaire was set as a mandatory question.

According to the sample size setting[11], 253 questionnaires were distributed. In the process of data collation, unqualified questionnaires were excluded, including the answer sheets with less than 1 minute of response time, the whole questionnaire ticked all the same options or regularity, and so on. In the end, 239 valid questionnaires were successfully recovered, with an effective recovery rate of 94.5%. All participants were informed and agreed to participate in the survey. The basic information of the students is detailed in Table I.

Table 1. Basic Information on Students

Year			Gender		
<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Male</i>	<i>Female</i>	
58(24.3%)	105(43.9%)	76(31.8%)	162(67.8%)	77(32.2%)	
The choice of College Entrance Examination			Volunteer Prospects of the Profession		
<i>Self-choice</i>	<i>Other people's wishes</i>	<i>Transferred Specialty</i>	<i>Popular</i>	<i>General</i>	<i>Neglected</i>
179(74.9%)	26(10.9%)	34(14.2%)	145(60.7%)	69(28.9%)	25(10.5%)
Training Room Environment			Individual Achievement in Class		
<i>Better</i>	<i>Average</i>	<i>Worse</i>	<i>Better</i>	<i>Average</i>	<i>Worse</i>
127(53.1%)	93(38.9%)	19(7.9%)	61(25.5%)	148(61.9%)	30(12.6%)

3.2 Methodology of the study

The study used questionnaires to collect data and used structural equation modelling and Amos 24.0 software to analyze and process the data from the valid questionnaires.

Questionnaire.

Combined with the literature review and interviews, this paper refers to the specialty identity scale compiled by BrickSon, Qin Panbo, etc., and designs a specialty identity questionnaire according to the actual situation, which is shown in Table II. The questionnaire includes two main parts: basic information and specialty identity.

(1) Basic information part: gender, grade, voluntary choice, employment prospect, training room environment and personal achievement in the class.

(2) Specialty identity part: contains 17 entries divided into 4 dimensions (specialty emotion, specialty behavior, specialty goal, specialty awareness). A 5-point Likert scale was used (1 point for strongly disagree, 2 points for disagree, 3 points for neutral, 4 points for agree, and 5 points for strongly agree).

Finally, Amos software was used to calculate the mean score and standard deviation of each dimension, where higher scores represent higher levels of specialty identification. The Cronbach's alpha coefficient of the scale in this study was 0.906, indicating high reliability and internal consistency.

Table 2. Design and Sources of Identity Questionnaire Topics

Questionnaire Dimensions	Number of Questions	Sources of Questions/Literature References
Specialty Emotion	6	BrickSon
Specialty Behavior	5	Qin Panbo
Specialty Goal	3	Qin Panbo
Specialty Awareness	3	BrickSon

4 Analysis of results

4.1 Structural model testing

The structural equation model consists of a measurement model and a structural model. The measurement model describes the relationship between the measurement indicators and the structural model, while the structural model describes the relationship between the structural variables.

Test of measurement model.

The test of the measurement model consists of several parts: reliability, convergent validity, and discriminant validity. In the reliability and convergent validity analysis using Amos 24.0, five questions were found to have factor loadings less than 0.6. To improve the reliability and convergent validity of the model, the authors decided to delete these questions with substandard standardized coefficients. After correction, the latent variable combination reliability CRs were all within the standardized values and each topic was significant, indicating that the corrected measurement model had better reliability and convergent validity (see Table III for details).

Table 3. Reliability and Convergent Validity of The Measurement Model

Construct	Item	N	Significance of Estimated				Item Reliability		Compo- site Re- liability CR	Conver- gence Va- lidity AVE
			Unstd.	S.E.	z-value	P	std.	SMC		
<i>Specialty Emotion</i>	SE1	239	0.781	0.078	10.024	***	0.626	0.392	0.881	0.555
	SE2	239	0.913	0.070	12.972	***	0.762	0.581		
	SE3	239	0.969	0.074	13.084	***	0.766	0.587		
	SE4	239	1.021	0.074	13.776	***	0.793	0.629		
	SE5	239	0.915	0.081	11.354	***	0.689	0.475		
	SE6	239	1.000	-	-	-	0.818	0.669		
<i>Specialty Behavior</i>	SB1	239	1.050	0.082	12.792	***	0.790	0.624	0.884	0.605
	SB2	239	0.996	0.081	12.326	***	0.768	0.590		
	SB3	239	1.025	0.077	13.248	***	0.818	0.669		
	SB4	239	0.976	0.083	11.772	***	0.734	0.539		
	SB5	239	1.000	-	-	-	0.776	0.602		
<i>Specialty Goal</i>	SG1	239	0.789	0.061	12.928	***	0.738	0.545	0.874	0.700
	SG2	239	0.914	0.058	15.78	***	0.892	0.796		
	SG3	239	1.000	-	-	-	0.872	0.760		
<i>Specialty Aware- ness</i>	SA1	239	1.045	0.051	20.575	***	0.909	0.826	0.938	0.835
	SA2	239	1.100	0.050	22.208	***	0.955	0.912		
	SA3	239	1.000	-	-	-	0.876	0.767		

Note: A '-' indicates that the item is a reference item.

In the assessment of discriminant validity, a comparison of the average variance extracted (AVE) with the Pearson's correlation coefficient between latent variables was used. By comparing the values in Table IV, it was found that the AVE values on the diagonal were greater than most of the other values in the same column of the peer group, indicating that the modified measurement model performed better in terms of discriminant validity.

Table 4. Tests of Discriminant Validity of Measurement Models

	Specialty Emotion	Specialty Behavior	Specialty Goal	Specialty Awareness
<i>Specialty Emotion</i>	0.745			
<i>Specialty Behavior</i>	0.818	0.778		
<i>Specialty Goal</i>	0.429	0.508	0.837	
<i>Specialty Awareness</i>	0.243	0.287	0.151	0.914

Structural model testing.

Structural equation modelling analysis of the research model through Amos 24.0 yielded the following analytical data: a chi-square value (χ^2) of 142.679, a chi-square degree-of-freedom ratio (χ^2/df) of 1.241, a comparative fit index (CFI) of 0.989, a goodness-of-fit index (GFI) of 0.935 and root mean square of the error of approximation (RMSEA) values of 0.032, an AGFI is 0.913 and SRMR is 0.0399. details are given in Table V, and from the analysis of the data, it can be learnt that the fit of the model meets the criteria recommended by the experts in the vast majority of cases. From the results of the analysis, all the fit indices of the research model are better than the critical values, so it can be considered that the constructed model fit validity is good.

Table 5. Fit Indices of The Study Model

Goodness of Fit Indicator	χ^2	df	χ^2/df	GFI	AGFI	RMSEA	SRMR	CFI	TLI (NNFI)
<i>Critical values</i>	-	-	<3	>0.9	>0.9	<0.10	<0.1	>0.9	>0.9
<i>Model analysis value</i>	318.037	203	1.567	0.893	0.866	0.049	0.486	0.967	0.962
<i>Corrected value</i>	142.679	115	1.241	0.935	0.913	0.032	0.0399	0.989	0.987

Research hypothesis testing.

By testing the hypotheses in the model, this study analyses the relationship between the influence and effects of the elements of specialty emotion, specialty behavior, specialty goal, specialty awareness and specialty identity. According to the results in Table VI, it can be concluded that hypotheses H1, H2, H3 and H4 are valid.

Specialty emotion has a significant positive effect on specialty identity.

Specialty behavior has a significant positive effect on specialty identity (C.R.>1.96, P<0.001).

Specialty goal has a significant positive effect on specialty identity (C.R.>1.96, P<0.001).

Specialty awareness has a significant positive effect on specialty identity (C.R.>1.96, P<0.001).

R², also known as squared multiple correlation, indicates the level of variance reflected by the predictors of the correlated factors [12]. From the results of the analysis, the minimum value of R² is 0.085 and the maximum value is 0.968, therefore, it can be concluded that in general, the interpretability of the variables is relatively good.

Table 6. Results of Research Model Hypothesis Testing

Endogenous		Exogenous	Unstd.	S.E.	C.R.	P	Hypothesis	std.	R ²
Specialty Emotion	←	Specialty Identity	1.000	-	-	-	true	0.832	0.692
Specialty Behavior	←	Specialty Identity	1.103	0.145	7.595	***	true	0.984	0.968
Specialty Goal	←	Specialty Identity	0.781	0.115	6.800	***	true	0.516	0.266
Specialty Awareness	←	Specialty Identity	0.373	0.093	3.995	***	true	0.292	0.085

4.2 Influencing factor model analysis

Based on the results of the aforementioned structural equation modelling test, the "specialty identity model" can be obtained (as shown in Fig. 2).

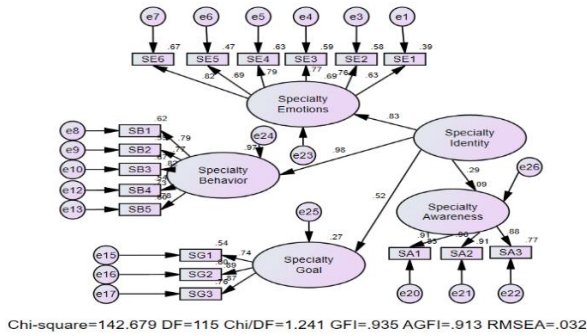


Fig. 2. Specialty Identity Model

It can be observed from Figure 2 that specialty identity is jointly influenced by multiple factors of specialty emotion, specialty behavior, specialty goal and specialty awareness. The results of the analysis show that specialty behavior is the most important direct influence on students' specialty identity, with an effect of 0.984. The key factors affecting specialty identity are specialty behavior, specialty emotion, specialty goal and specialty awareness in order of intensity.

5 Discussion

From the results of the analysis, it can be seen that specialty behavior plays an important role in shaping and strengthening students' identification with the profession they are studying. Teachers can stimulate students' own love for their majors through vivid teaching cases and interesting teaching methods. Improve students' enthusiasm for active learning, so that they are more willing to devote time to in-depth study of the studied profession. In terms of curriculum, practical courses can be expanded so that students have the opportunity to apply what they have learnt to practical situations, cultivate practical skills, and improve their specialty awareness level. Schools can also set up a variety of incentives to reward students with outstanding academic performance, encouraging them to devote themselves more diligently to the majors they study and cultivate specialty behaviors.

Specialty emotion has a direct and significant impact on specialty identity, with an effect size of 0.832. This finding emphasizes the key role of positive Specialty emotion in forming and strengthening specialty identity. Positive specialty affective experiences are conducive to students' fuller and deeper engagement in professional learning and practice, which in turn promotes students' identification with and love of their profession.

Specialty goal has a direct impact on specialty identity, with an effect size of 0.516. This finding suggests a close relationship between specialty goal and specialty identity. Specialty goal is students' expectations and visions for the future development of their majors, and these expectations and visions can stimulate students' positive attitudes and deep love for their majors.

Specialty awareness has a smaller effect on specialty identity, with an effect size of 0.292. This finding suggests that specialty awareness mainly focuses on students' knowledge and understanding of their majors, and although specialty awareness provides a certain degree of rational understanding, specialty identity relies more on factors such as the actions, emotions, and goals students individually strive for in their professional learning. Therefore, although specialty awareness has a certain influence on specialty identity, it is not the only or the most decisive factor.

Meanwhile, the results of the study also show that the level of specialty identity of the students in this major is generally in the medium-low level. There is no significant difference between male students on any of the four factors of specialty identity, but the level of specialty identity of female students is significantly lower than that of male students. In addition, there are also significant differences in specialty identity between different grades, and students' specialty identity decreases year by year in freshman, sophomore, and junior years. In terms of grades, students in the better grades group scored higher than the average grades group, and the average grades group scored higher than the worse grades group. This suggests that students with good grades work harder on their behavior and therefore they have a higher specialty identity.

6 Summary

By using structural equation modelling technique, a model of influencing factors of specialty identity in blockchain technology application was constructed. The conclusion shows that the influencing factors of identity, in order from strong to weak, are specialty behavior, specialty emotion, specialty goal and specialty awareness, which together affect students' specialty identity. This conclusion validates the findings of scholar BrickSon's research related to college students' specialty identity.

The following are some specific strategies to help students enhance their specialty identity:

(1) Optimize the talent training program and curriculum system: Continuously optimize the talent training program and curriculum content to ensure a close fit with industry needs and trends, which helps to improve the practicality and attractiveness of the profession and deepen students' sense of specialty identity.

(2) Establishing co-operative relationships with industrial enterprises: introducing real projects in enterprises into the classroom to provide students with opportunities to come into contact with the actual working environment, thus increasing students' sense of specialty identity.

(3) Mixed-gender grouping system: taking advantage of boys' strengths in professional learning, the mixed-gender grouping system stimulates girls' interest in the profession and makes it easier for them to integrate into the learning atmosphere.

(4) Adjusting the difficulty of the courses: Adjusting the difficulty of the courses for senior students to ensure that the course content matches the students' academic level. Through reasonable difficulty settings, the gap in grade identity can be reduced, so that students can face the challenges of professional learning with more confidence.

(5) Differentiated teaching methods: Adopt differentiated teaching methods according to students' performance levels, provide learning tasks of different levels of difficulty and forms to meet the needs of students at different levels, reduce the impact of performance differences on specialty identity, and ensure that every student can enjoy the learning process.

Fund projects

Hubei Provincial Education Science Planning Project: Research on the Realization Path of "Vocational-Population Integration" Higher Education Stage for Software Technology Major (2023GB270).

Hubei Provincial Educational Science Planning Project: Research on the Application of Dual-Case Driven Teaching Method in Software Technology Specialty Group (2023GB267).

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