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Sustainability of University Technology Transfer: Mediating Effect of Inventor's Technology Service

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Abstract: Based on the perspective of knowledge transfer and the technology acceptance model (TAM), this paper constructs a university technology transfer sustainable development model that considers the inventor's technology service from the perspective of the long-term cooperation of enterprise, and analyzes the mediating effect of the inventor's technology service on university technology transfer sustainability. By using 270 questionnaires as survey data, it is found that the availability of an inventor's technology service has a significant positive impact on the attitude tendency and practice tendency of enterprise long-term technological cooperation; enterprise technology absorption capacity and trust between a university and an enterprise also have significant influence on an inventor's technical service availability. Therefore, the inventor's technology service acts as a mediator in the relationship between university technology transfer sustainability and influence factors. Universities ought to establish the technology transfer model, which focuses on the inventor's tacit knowledge transfer service, and promotes the sustainable development of the university.

Keywords: sustainability; university technology transfer; mediating effect; tacit knowledge transfer; inventor's technology service

1. Introduction

University technology transfer is an important way for university research to promote social development. The sustainability of university technology transfer is related to the sustainable development of both the university and society [1]. Based on the perspective of knowledge, technology is a mixture of explicit knowledge and tacit knowledge [2]. As an indispensable part of technology, tacit knowledge transfer will directly affect university technology transfer [3]. Therefore, it is necessary to study the role of the inventor's tacit knowledge transfer in the sustainable development of university technology transfer, in order to promote the sustainable development of the university.

The current research on sustainable development at university level is mainly concerned with the sustainability of higher education [4,5]. However, sustainable development at university level refers to not only the sustainability of higher education, but also the sustainability of university research and development [6]. Sustainable development at university level not only examines the impact of university research on the economy and environment, it also looks at the impact of knowledge transfer [7]. Technology services and a closer connection between university and the external environment are very important for the sustainability of university technology transfer. There are many obstacles to the sustainability of university research; a lack of training, cooperation, educational research, and extension are the important factors that affect the sustainable development of universities [8]. The establishment of a technology transfer office could strengthen technology transfer,

and is an important way to simultaneously promote the sustainable development of the economy, society, and the university [9].

The existing literature has found that as a kind of knowledge product, patent technology is a mixed knowledge package that coexists with explicit knowledge and tacit knowledge. After successful technology research and development (R&D), the research staff write patent texts—that is, explicit knowledge—show technological achievements and innovativeness, and apply for patents. However, there is also a great deal of patent technology development and application-related experience and know-how accumulated during the R&D process. In other words, tacit knowledge is still stuck in the hands of research staff, because it is difficult to encode the text and it is unable to be written into the patent text [10]. Tacit knowledge, such as experience and know-how, is directly related to the efficiency and effectiveness of the application of technology transformation, and is an indispensable product content of the patented technology products [11]. Therefore, patent technology products include not only explicit knowledge such as prototypes of technological achievements, including patent texts, but also tacit knowledge such as skills and know-how [12] that are not written into patent texts.

University technology transfer is not only the transfer of technology-related rights, it is also the transfer of technology-related knowledge [13]. Due to the knowledge characteristics of technology, the technology trading market is completely different from the traditional product market. Technology transaction is non-immediate and phased [14]. Since patent technology knowledge contains explicit knowledge and tacit knowledge, accordingly, university technology transactions include two stages: explicit knowledge transfer and tacit knowledge transfer [15]. The explicit knowledge transfer of a university technology transaction is manifested in the delivery of a technology achievement prototype, and tacit knowledge transfer is manifested in technical services such as technical training and consultation [16].

Some studies have also analyzed the influence of tacit knowledge transfer on the choice of technology transfer strategy, and found that tacit knowledge leads to moral risks in the process of technology transfer, which can help reduce moral risks through a package of licenses and licensing fees [17–19]. For example, a technical licensing contract usually involves tacit knowledge or technical know-how complementary elements, such as technical services, technical installations, and assistance in R&D systems [3].

In view of the factors that influence technology transfer, the existing literature has made a lot of achievements. Based on the process of knowledge transfer, this paper studies influences on the transfer of tacit knowledge from the factors of knowledge itself [20], the transfer subject, and the transfer environment [21]. A key to the mechanism of sustainable technology transfer lies in the tacit knowledge transfer mechanism. The knowledge transfer mechanism includes transfer willingness, a good cooperative relationship, a knowledge-oriented organizational culture, and human resource exchange between the two parties. The mechanism of cultural coordination, communication, and trust, as well as the knowledge transfer of learning, will affect the knowledge transfer of technological entrepreneurship at university [22]. Tacit knowledge transfer and sharing mechanism is established with the intentions of enhancing the knowledge output capability of the university, thinking highly of the role of enterprise cooperation during the knowledge sharing of the industry, and maintaining the interaction between the enterprise and the university [23]. Enterprises, universities, or research institutes choose knowledge partners that are determined by factors such as common values, the external environment, a collaborative theme, knowledge gaps, and demand [24].

The technology acceptance model (TAM) is often used to explain and predict consumers' acceptance of information technology (IT) products, and analyze the behavioral propensity, applied attitude, practical behavior, technical usefulness, and usability judgment of technology adoption [25,26]. In the technology acceptance model, the attitude tendency of technology adoption is a kind of cognitive activity, which reflects the willingness of consumer technology adoption. However, the practical behavior of technology adoption is the result of attitude tendency: the richer the consumer's behavioral tendency, the more likely it is that the actual behavior will occur. Therefore, in this model, the behavior

attitude is the consumer's subjective perception of the technology adoption, and this perception is influenced by consumers' evaluation on the target technology, or in other words, estimations of the usefulness of the technology and the usability of the technology. Usefulness refers to consumer judgments on the promotion of efficiency and performance improvement of the target technology, and the usability refers to consumer judgment on the degree of difficulty in using the target technology.

In the TAM model, estimations of technology usefulness and technical usability determine the consumer's attitude tendency, and the consumer's attitude tendency and technology usefulness determine the consumer's actual behavior [27]. Therefore, the basic TAM model mainly includes four variables: technology usefulness, technology usability, technology adoption attitude tendency, and technology adoption behavior. The TAM model is widely used in electronic commerce, mobile commerce, and other product market research, because of its simple structure and strong explanatory power [28]. On the basis of the original model, the existing literature further incorporated environmental variables and market conditions variables into the model, and studied the effects of environmental factors, market conditions, and network externalities on consumer technology adoption behavior. Some research brings network externality into the TAM model. Take the tablet computer market as an example: measure the direct network effect with a consumer installation foundation, measure the indirect network effect with complementary products, and analyze the influence of the direct network effect and indirect network effect on consumers' consumption tendencies for new products [29].

Existing studies have analyzed various factors that influence the attitude and practice of consumer technology adoption, but have not applied the TAM model to study the university technology transfer market, nor subdivided the influence of explicit knowledge products and tacit knowledge services on the attitude and practice of technology adoption at the technology product level.

Based on above literature review, we can see the importance of university technology transfer to the sustainable development of universities and society [30], as well as the important influence of tacit knowledge on university technology transfer. However, the existing literature neglects the special role of the inventor's tacit knowledge transfer in the sustainability of technology transfer from the perspective of enterprise long-term cooperation.

This paper expands the technology acceptance model and introduces the inventor's technology service availability dimension and enterprise long-term cooperation dimension, and analyzes the mediating effect of the inventor's technology service in the long-term cooperative between enterprise and university. There are two main purposes. First, it connects the existing research of sustainable development and the study of tacit knowledge transfer, and ties the sustainable development of the university technology transfer with the inventor's technology service. It is hoped that universities will take technology transfer as one of the most important goals of sustainable development. Second, the important role of a tacit knowledge technology service in the sustainability of university technology transfer is put forward, and it is hoped that the university technology transfer office will establish a technology transfer working model that is concerned with technology service and promote the sustainable development ability of the university.

This paper uses the data of 270 enterprise questionnaires to analyze the special role of an inventor's technology service in the sustainable development of university technology transfer from the perspective of the long-term cooperation attitude tendencies and practice tendencies among enterprises. The research finds that the availability of an inventor's technology service has a significant positive impact on the attitude tendency and practice tendency of enterprise long-term technological cooperation, enterprise technology absorption capacity, and trust between the university and the enterprise, all of which have a significant influence on inventor's technical service availability. It can be seen that an inventor's technology service has a mediating effect on the sustainable development of university technology transfer.

2. Materials and Methods

2.1. Theory Model

Based on the TAM model, from the perspective of technology as a systematic product, this paper broadens the dimension of consumers' perceptions and evaluations of technology. The availability of technical services, technical availability, and technical usability are incorporated into the model, which points out the enterprises' perception of technical services availability would affect the enterprise's long-term technological cooperation attitude tendency and practice tendency in university technology transfer. In order to research the sustainable development of university technology transfer, the model measures the sustainability of university technology transfer from the two dimensions: the long-term attitude tendency and the long-term practice tendency of enterprises, who act as recipients of university technology transfer. As an acceptor of technology transfer, the long-term attitude tendency and long-term practice tendency of enterprises can be regarded as a result of technology transfer in university, and also can represent the sustainability of university technology transfer. If the attitude tendency and practice tendency of long-term technology cooperation between enterprises and universities is high, it shows that the sustainability of university technology transfer is relatively high. The details are as follows:

(1) Inventor's technology service availability and enterprise long-term technological cooperation attitude tendency and practice tendency

The more technology services that enterprises can get from universities, the more likely they are to participate in the long-term technology transfer activities of universities, and the more likely they are to make practical technology transfer transactions [31]. The higher the enterprise's availability of the university technical service, which is a complementary product, the higher the enterprise's expected utility and the greater the enterprise's expected return of the technology transfer, and the more they inclined they are to maintain a positive and active trading attitude, make trading decisions, and pay the actual behavior [32]. Much of the literature suggests that the availability of complementary products will directly affect the consumption attitude and consumption decisions that surround the system products [33,34]. For example, studies that examined the consumer's consumption decisions in the mobile communication market have found that the quantity of complementary products expected by consumers would significantly affect consumers' consumption decisions on new products [35]. Therefore, the following assumptions are put forward:

Hypothesis 1. *The higher the enterprise's evaluation on the availability of an inventor's technical service, the higher the tendency of enterprise long-term technological cooperation attitudes.*

Hypothesis 2. *The higher the enterprise's evaluation on the availability of an inventor's technical service, the higher the tendency of enterprise long-term technological cooperation practices.*

(2) Enterprise's own factors and technical service availability

The enterprise's own factors mainly refer to the technology absorption capacity of the enterprise. Technology absorption capacity refers to the technology receiver's ability to identify external technical knowledge, understand technical knowledge, and utilize technical knowledge. The current research in knowledge management literature shows that the technology absorption ability of enterprises has a significant impact on the technological cognition and the technological evaluation of enterprises [36]. Enterprises with strong technology absorption ability can use technical knowledge more effectively to solve the technical problems they face and rapidly realize the transformation of technological achievements and market-oriented product development [37,38]. Generally speaking, among university technology transfer activities, university technical ability is higher than that of enterprise; there is a certain technical distance between universities and enterprises. For enterprises,

university technology involves highly systematic and complex knowledge; only enterprises with strong technology absorption ability can accurately judge and identify the technical knowledge they need in the process of technology transfer, especially tacit knowledge. Thus, only such enterprises can quickly understand the tacit knowledge delivered by a university technical service and determine whether this knowledge can be used to solve the problems they face [39]. Moreover, the distance between the enterprises with strong technology absorption ability and college inventors is relatively small, the requirements for college technical service levels are relatively low, and the evaluation of the available college technical service levels will be relatively high. Based on this, the following hypothesis is proposed.

Hypothesis 3. *The stronger the technology absorption ability of enterprises, the higher its evaluation of the availability of an inventor's technical services.*

(3) Market environmental factors and technical services availability

Market environmental factors mainly refer to the degree of trust between enterprises and universities, and the trading environment of a university technology market.

Trust refers to mutual trust between the two sides, which is manifested in mutual recognition and trust in the ability and behavior between the two parties [40]. Since it is difficult to accurately quantify technical knowledge, there are moral hazards and adverse selection problems in the process of knowledge transfer of technology, and the transfer parties are worried about each other [41]. For college inventors, the fear of not receiving a full return from the other party will reduce their willingness to transfer knowledge. For enterprises, they worry that inventors could not meet their knowledge needs, or that inventors deceive them by using the characteristics that tacit knowledge are difficult to measure, and thus could not transfer all of the knowledge that they need to them. Knowledge transfer activities require both parties to pay the cost of time and effort, so prior to knowledge transfer, technicians have an expectation about whether to transfer knowledge with the other party, which is mainly based on the degree of mutual trust between the two sides. Based on this, the following hypothesis is proposed.

Hypothesis 4. *The higher the degree of trust between enterprises and universities, the higher the enterprise's evaluation of the availability of an inventor's technical services.*

The technology market trading environment mainly includes market transaction information, transaction convenience, transaction procedure complexity, and so on [23–42]. First, the transfer incentive of university inventors is relatively insufficient; the inventor has acquired a sense of achievement and academic status in the field of scientific research after the achievement of his technological achievements, and there is often a lack of incentives to further deepen the transformation of achievements and engage in technical application [43]. As a result, the information about university technological achievements is stuck in the inventor, but the exchange mechanism of technical information and achievement information between the two sides is not smooth. Secondly, since the university is the ivory tower in society, the technological inventors are mostly engaged in scientific research. They are inexperienced in dealing with the technology market, and it is difficult to reach an agreement quickly on the details of the transaction [44], especially the tacit knowledge service link. This inevitability makes technology transactions less efficient, and also affects the expectations of enterprises regarding the availability of an inventor's technological services. Based on this, the following hypothesis is proposed.

Hypothesis 5. *The better the trading environment of the university technology license market, the higher the enterprise's evaluation of the availability of an inventor's technical services.*

According the traditional assumptions of the TAM model, technology usefulness and usability determine long-term enterprise technological cooperation attitude tendency, and enterprise long-term technological cooperation attitude tendencies, and technology usefulness determine enterprise long-term technological cooperation practice tendencies.

Based on the above hypothesis, an enterprise long-term cooperation model that considers a tacit knowledge technology service can be obtained, as shown in Figure 1.

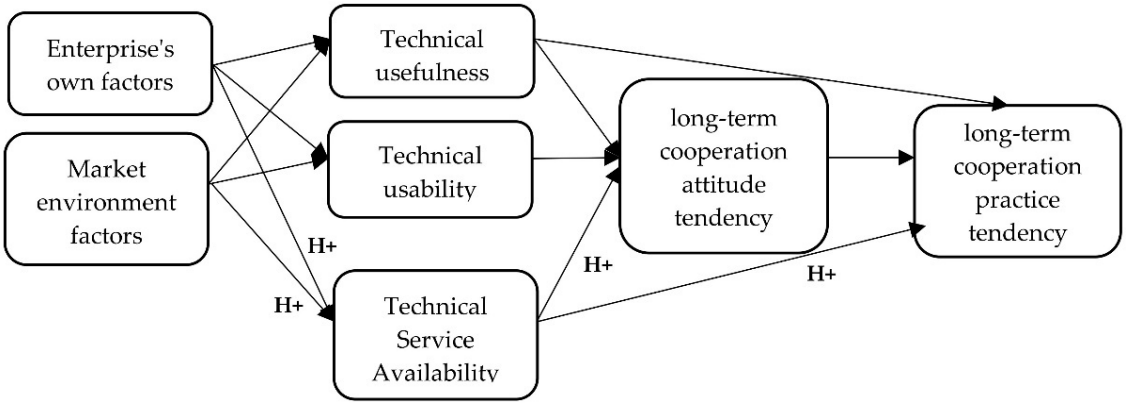

Figure 1. University technology transfer sustainable development conceptual model.

2.2. Method and Variable Design

In this paper, the structural equation model is used to analyze the above model.

Based on the constructed long-term cooperation model that considering the tacit knowledge technology service, the variables involved include technology service availability, technology usefulness, technology usability, long-term cooperation attitude tendency, long-term cooperation practice tendency, enterprise technology absorption ability, trust, and trading environment. Since the variable measure is difficult to directly quantify, the measurement is implemented by designing latent variable observation items.

On the basis of fully learning from the mature scales, this paper designs the measuring items of eight latent variables involved in the model, and forms a measurement scale for the acceptance of the university technology market.

The design of the scale adopts the Richter five-point scale, in which: 1 = totally disagree; 2 = disagree; 3 = uncertain; 4 = agree; and 5 = totally agree. The design method of the scale includes the following three aspects: first, directing references to maturity scales that have been tested in similar literature studies; second, according to the existing mature scale, modifying the scale by combining the object of study and the Chinese context; and third, discussing with experts in the field of research, to implement the further revision and perfection of the scale.

After the initial completion of the scale design and before the formal investigation, a small range of pre-investigation was conducted at a college and an enterprise, and interviews and discussions were carried out with research subjects. Based on the feedback of the pre-investigation, we modified and perfected the scale, optimized the content of the measurement items, eliminated one measurement item each regarding the availability of technical services and the technical absorption capacity of enterprises, and added one measurement item to the trading environment. In the end, a formal measurement scale consisting of 26 measurement items was formed. The formal measurement scale items and sources are shown in Table 1.

Table 1. Formal measurement scale items and sources.

Variable	Measurement Item	Source
Technical Service Availability	1. Among the transfer, the university will actively provide technical service.	Deng (2010) [35]
	2. Among the transfer, the university will provide multiple technical services.	
	3. Among the transfer, the university will provide timely technical service.	
	4. Among the transfer, the university will provide high-quality technical service.	
Attitude tendency	5. I think it's worth getting long-term technical transfer from the university.	Venkatesh (2003) [26] Venkatesh and Bala (2008) [27]
	6. I hope to get long-term technical transfer from the university.	
	7. I believe that long-term cooperation will bring great profit to the enterprise.	
Practice tendency	8. I often pay attention to the trends of technical achievements in university.	
	9. I will actively establish long-term technical communication channels with university.	
	10. I will actively maintain these long-term communication channels with university.	
Technical usefulness	11. This technology can improve production efficiency and quality.	Gefen (2003) [41]
	12. The technology is in a leading position in the industry.	
	13. This technology can improve the competitiveness of enterprises.	
Technical usability	14. The technology can be directly used in manufacturing or production.	
	15. The conversion and application of this technology does not require a great deal of time and effort.	
	16. The technology can produce quick results and benefits.	
Absorbing capacity	17. Enterprises can quickly master the know-how of technology application.	Nooteboom (2007) [36]
	18. Enterprises can quickly digest and absorb the technological achievements.	
	19. Enterprises can quickly apply the technology to solve technical problems.	
Trust	20. Universities are honest and friendly in the process of technology transfer.	Levin and Cross (2004) [40]
	21. Universities are able to transfer technical knowledge in accordance with the terms of contracts.	
	22. Universities can become long-term partners of enterprises.	
Trading environment	23. Enterprises can easily find relevant information about technological achievements in universities.	Gefen (2003) [41]
	24. It is easy for an enterprise to get in touch with the inventor of a university technical achievement.	
	25. University technology transactions do not require too many procedures.	
	26. University transaction negotiations don't take much time.	

2.3. Data Collection

We collected empirical data by questionnaire. The validity of the questionnaire data was ensured by first selecting manufacturing enterprises with intellectual property rights as the object of investigation, such as science and technology enterprises, hard science and technology innovation start-ups, etc. This kind of enterprise generally has experience with university technology transfer or potential university technology transfer demand. Second, in order to reduce the impact of the regional economy and science and technology factors on the sample data, the scope of investigation will be locked in Xi'an, in conjunction with Shaanxi Provincial Science and Technology Resources

Coordination Center, and the Xi'an City Science and Technology Bureau to jointly carry out the investigation. The survey subjects are controlled in the scope of enterprise technical management personnel, R&D executives, technical supervisors, and managers in charge of technology. Each of the aforementioned enterprises selected one to three survey subjects to issue the questionnaire.

The survey was mainly conducted by paper questionnaire and the questionnaire net WeChat platform online; a total of 400 questionnaires were distributed and 376 were recovered. After eliminating the invalid questionnaires, which had incomplete answers or options that were either repeated or eliminated, there were 270 valid questionnaires, accounting for 71.8% of the collected questionnaires. The whole process of data collection, from the selection of respondents, the distribution of questionnaires, and the quality control of questionnaires strictly follows the procedures of the questionnaire, and the reliability of the whole set of data is high.

The basic information of the questionnaire includes gender, age, educational level, employment years, position, enterprise scale, whether or not have ever participated in the universities technology transfer activities etc. Overall, 62% of the respondents were male, more than 85% of the respondents had a bachelor's degree or above, more than 78% of respondents were technical department managers or above, 40% of the enterprises were large enterprises, and 40% had ever participated in university technology-trading activities. Descriptive statistics were carried out on the scores of 26 items in eight latent variables of the formal scale. See Table 2 specifically.

Table 2. Descriptive statistics of latent variable measurement items of the sample.

Latent Variable	Items	Average Value	Standard Deviation	Mean of the Latent Variable
Technical Service Availability	Q1	3.80	0.812	3.76
	Q2	3.72	0.863	
	Q3	3.74	0.841	
	Q4	3.84	0.812	
Attitude tendency	Q5	3.69	0.834	3.74
	Q6	3.78	0.915	
	Q7	3.74	0.905	
Practice tendency	Q8	3.36	0.905	3.38
	Q9	3.49	0.855	
	Q10	3.3	0.752	
Technical usefulness	Q11	4.06	0.750	4.03
	Q12	3.83	0.821	
	Q13	4.11	0.676	
Technical usability	Q14	3.30	0.880	3.21
	Q15	3.15	0.972	
	Q16	3.16	0.898	
Absorbing Capacity	Q17	3.73	0.896	3.69
	Q18	3.71	0.816	
	Q19	3.61	0.908	
Trust	Q20	3.85	0.789	3.96
	Q21	4.07	0.710	
	Q22	3.94	0.761	
Trading environment	Q23	3.16	0.921	3.13
	Q24	3.09	0.914	
	Q25	3.20	0.874	
	Q26	3.07	1.013	

3. Results

3.1. Statistical Test

3.1.1. Reliability Test

The reliability test is a necessary means to test the questionnaire data; reliability reflects the consistency and stability of the test results. Using SPSS to test the reliability of the sample data, the test results are shown in Table 3. It can be seen that the total Cronbach's α coefficient of the sample is 0.942, which indicates that the sample data is very reliable, the internal consistency is high,

and the measurement results are reliable. According to the eight latent variables, each Cronbach's α coefficient is greater than 0.700, which indicates that the measured data of each latent variable have good reliability and the results are stable, which is suitable for further model fitting research. KMO test is used to compare simple correlation coefficient and partial correlation coefficient among variables, which value is between 0 and 1.

Table 3. Results of reliability test of sample data.

Variable	Cronbach's α	KMO Value	Bartlett Value
Overall	0.942	0.873	2040.706 ***
Technical Service Availability	0.898	0.776	320.935 ***
Attitude tendency	0.761	0.718	85.625 ***
Practice tendency	0.864	0.777	154.548 ***
Technology availability	0.849	0.732	121.464 ***
Technical usability	0.809	0.720	99.921 ***
Enterprise technology absorption capacity	0.893	0.799	235.155 ***
Trust	0.755	0.712	70.793 ***
Trading environment	0.847	0.787	269.873 ***

*** $p < 0.001$.

3.1.2. Structural Validity Test

We used AMOS 22.0 (IBM Corporation, Armonk, America, 2013) for confirmatory factor analysis (CFA) to test the structural validity of the scale. The maximum likelihood estimation provided by AMOS was used to estimate the model parameters, and the fixed coefficient method was chosen to estimate the bearing coefficient of the corresponding latent variable to the measurement item pair. CFA belongs to a special application of AMOS analysis; the measurement model deals with the relationship between the measurement item and the corresponding latent variable to determine whether the measurement item can adequately represent the corresponding latent variable. CFA belongs to a special application of the AMOS model. As the AMOS model can handle the estimation and analysis of potential variables, it has high theoretical priori. If the researchers can put forward appropriate measurement variables to form a measurement model for the content and properties of potential variables, the structure or influence relationship of potential variables can be carried out by the AMOS model.

The estimation program for potential variables in AMOS tests the suitability of the factor structure previously proposed by the researchers. Once the foundation of the model is established, the causality of the potential variables can be further explored. Generally, CFA is a preprocess or infrastructure for the integration of AMOS analysis. Therefore, the model hypothesis of the measurement model is that the mean value of the error term is zero, the error term is not related to the factor, and the error term is not related to each other. According to the above principles, the measurement model of this study is as shown in the diagram, and the measurement model is a model of standardized parameter estimation.

The results of confirmatory factor analysis are shown in Table 4. Based on the measurement model, the standard factor load coefficients of 28 measurement items were obtained, and the 28 estimated parameters were all greater than 0.600, which indicated that the scale had good structural validity, all of the measurement items matched well with the sample data, and the quality of the model scale was good.

After using AMOS software to carry out confirmatory factor analysis, it is necessary to further examine the fitting effect of the measurement model and test whether the items set can be statistically significant according to the theory and practice, and can fully represent the corresponding latent variables.

Table 4. Results of confirmatory factor analysis (CFA).

Items	Technical Service Availability	Attitude Tendency	Practice Tendency	Technical Usefulness	Technical Usability	Absorbing Capacity	Trust	Trading Environment
Q1	0.874							
Q2	0.863							
Q3	0.848							
Q4	0.635							
Q5		0.931						
Q6		0.816						
Q7		0.768						
Q8			0.695					
Q9			0.881					
Q10			0.904					
Q11				0.839				
Q12				0.768				
Q13				0.636				
Q14					0.683			
Q15					0.930			
Q16					0.682			
Q17						0.820		
Q18						0.884		
Q19						0.866		
Q20							0.764	
Q21							0.632	
Q22							0.702	
Q23								0.700
Q24								0.875
Q25								0.609
Q26								0.769

3.1.3. Goodness of Fit Test

In this paper, according to the viewpoint of Hair [45], eight specific indexes of the three criteria—the absolute fitting index, value-added fitting index, and reductive index—will be selected to test the goodness of fit of the measuring model. As shown in Table 5, the absolute fitting index consists of root mean square residual (RMR) and root mean square error of approximation (RMSEA), the value-added fitting index consists of the NFI (normed fit index), TLI (Tucker–Lewis index) and IFI (incremental fit index), the reductive index consists of the PGFI (parsimony goodness-of-fit index), PNFI (parsimony normed fit index), and the PCFI (parsimony comparative fit index). The RMR shows that the square root of the sum of squares of residuals after the measured matrix is subtracted from the model matrix, which can be understood as fitting residuals. Generally speaking, the RMR value is acceptable below 0.05. The RMSEA (root mean square error of approximation) represents the square root of the sum of squares of asymptotic residuals. Generally speaking, when the RMSEA value is above 0.1, it indicates the fitting error of the model; if the RMSEA value is less than 0.08, it indicates that the fitting degree of the model is acceptable. All of the adaptation standard and test results are shown in Table 5, and the test indicators in Tables 6 and 7 are the same as those in Table 5.

Table 5. Goodness of fit test table.

Statistical Test	Index Name	Adaptation Standard	Test Results	Test Judgment
Absolute fitting index	RMR (root mean square residual)	<0.05	0.039	pass
	RMSEA (root mean square error of approximation)	<0.08	0.063	pass
Value-added fitting index	NFI (normed fit index)	>0.90	0.956	pass
	TLI (Tucker–Lewis index)	>0.90	0.921	pass
	IFI (incremental fit index)	>0.90	0.976	pass
Reductive index	PGFI (parsimony goodness-of-fit index)	>0.50	0.727	pass
	PNFI (parsimony normed fit index)	>0.50	0.731	pass
	PCFI (parsimony comparative fit index)	>0.50	0.680	pass

From the results of the above table, we can see that the selected eight statistical test indexes—such as the absolute fitting index, value-added fitting index, and reduction index—have passed the test and

satisfied the requirements accepted by the model. It can be seen that the measurement model and data have a high degree of fit.

3.2. Empirical Results

In order to verify the rationality of the theoretical model and hypothesis mentioned above, the hypothesis path is tested by structural equation. According to the long-term cooperation model considering the tacit knowledge technology service in Figure 2, the structural model of data fitting is constructed by using AMOS, as shown in Figure 3. In the same way as the measurement model, the fitting evaluation of the structural model, the goodness-of-fit test, the significance test of the measurement item, and the significance test of the path coefficient are carried out by the same method.

Table 6 gives the test results of the path coefficient and the goodness-of-fit of the structural model. It can be found that the estimated value of the path coefficient of the influence of technology availability on attitude tendency is 0.205 and the significance test p value was 0.293, which are much larger than the critical value of 0.05. Therefore, there is no good reason to believe that the path coefficient is significantly different from zero at a 95% confidence level, so the original hypothesis is not rejected; that is, technical usefulness has no significant effect on the propensity to transfer technology. Similarly, the impact of the trading environment on technology usefulness, technical usability, and the availability of technology services is as high as 0.866, 0.991, and 0.545, respectively, which means that the trading environment has no significant impact on technology usefulness, technical usability, and the availability of technology services. That is, the construction of the trading environment is not reasonable in terms of technology usefulness, technical usability, and the availability of technology services.

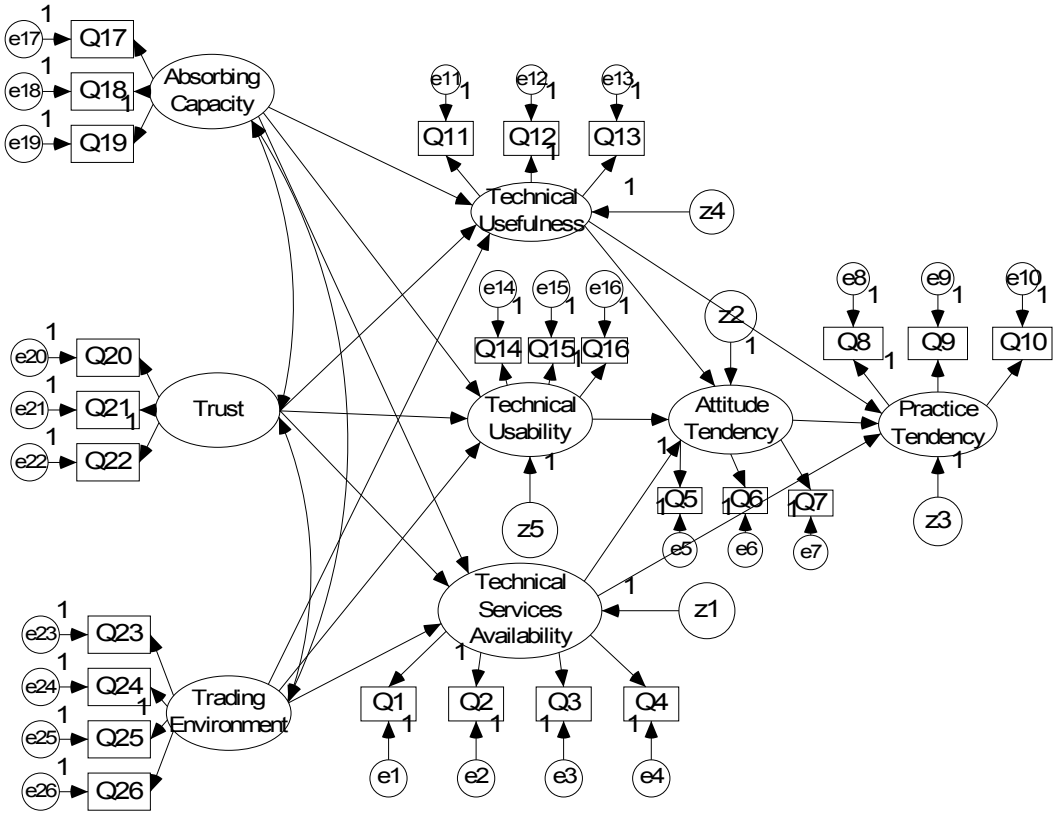

Figure 2. Structural model diagram constructed by AMOS.

Table 6. Structure model fitting path coefficient test result.

Influence Path	Estimated Value	Standard Deviation	CR Value	*p*-Value	Statistical Test	
Technical service availability → Attitude tendency	0.343	0.129	2.649	0.008	RMR	0.046
Technical service availability → Practice tendency	0.233	0.104	2.241	0.025	RMSEA	0.062
Attitude tendency → Practice tendency	0.473	0.114	4.142	***	NFI	0.959
Technical usefulness → Attitude tendency	0.205	0.195	1.051	0.293	TLI	0.966
Technical usefulness → Practice tendency	0.711	0.171	4.168	***	IFI	0.956
Technical usability → Attitude tendency	0.215	0.206	2.041	0.038	PGFI	0.727
Enterprise technology absorption capacity → Technical usefulness	0.222	0.075	2.956	0.003	PNFI	0.724
Enterprise technology absorption capacity → Technical usability	0.446	0.093	4.803	***	PCFI	0.626
Enterprise technology absorption capacity → Technical service availability	0.559	0.114	4.919	***		
Trust → Technical usefulness	0.366	0.140	2.620	0.009		
Trust → Technical usability	0.363	0.137	2.656	0.008		
Trust → Technical service availability	0.400	0.195	2.047	0.041		
Trading environment → Technical usefulness	0.015	0.091	0.169	0.866		
Trading environment → Technical usability	0.001	0.088	0.012	0.991		
Trading environment → Technical service availability	−0.083	0.138	-0.61	0.545		

*** $p < 0.001$.

The above analysis results show that the original structural model needs to be further modified and perfected. In the structural model, the direct impact of technical usefulness on attitude tendency and the direct impact of trading environment on technical usefulness, technical usability, and technical services availability are not significant, so we need to delete them and implement the modification of the model. Therefore, the four influence paths mentioned above are deleted from the structural model to form a modified model. The modified model is refitted to fit the path coefficient and the goodness-of-fit test, as shown in Table 7.

Table 7. Test results of the fitting path coefficient of the modified model.

Influence Path	Estimated Value	Standard Deviation	CR Value	*p*-Value	Statistical Test	
Technical service availability → Attitude tendency	0.306	0.128	2.391	0.017	RMR	0.045
Technical service availability → Practice tendency	0.208	0.104	2.006	0.045	RMSEA	0.062
Attitude tendency → Practice tendency	0.481	0.110	4.380	***	NFI	0.957
Technical usefulness → Practice tendency	0.746	0.169	4.414	***	TLI	0.964
Technical usability → Attitude tendency	0.405	0.191	2.126	0.034	IFI	0.968
Enterprise technology absorption capacity → Technical usefulness	0.233	0.075	3.087	0.002	PGFI	0.728
Enterprise technology absorption capacity → Technical usability	0.432	0.091	4.743	***	PNFI	0.730
Enterprise technology absorption capacity → Technical service availability	0.546	0.111	4.925	***	PCFI	0.635
Trust → Technical usefulness	0.356	0.111	3.216	0.001		
Trust → Technical usability	0.334	0.107	3.133	0.002		
Trust → Technical service availability	0.318	0.147	2.167	0.030		

*** $p < 0.001$.

From Table 7, it can be seen that in the modified structural model, the absolute values of CR in each influence path are above 1.96, and the p values are all less than 0.05. Therefore, the influence path coefficient in the model in the 95% confidence interval is significantly different from zero. The modified model is tested by goodness of fit, and has a higher fitting degree with the data.

3.3. Analysis and Discussion

According to the fitting results of the modified structural model, the influence path and the path coefficient of the technical transfer acceptance expansion model under the indirect network effect can be obtained, as shown in Figure 3.

It can be seen that the fitting results of the long-term cooperation model basically meet the basic assumptions of the original TAM model, except that the technical usefulness has no significant effect on the long-term cooperation attitude tendency. Meanwhile, the other influence paths are the same as the original TAM model. The technology usefulness has a significant impact on the long-term cooperation practice tendency, the path coefficient is 0.75; the technology usability has a significant positive effect on the long-term cooperation attitude tendency, the path coefficients is 0.41. Meanwhile, the effect on long-term cooperation practice tendency is not significant, which indicates that any expansion based on the TAM model should be appropriate and reliable.

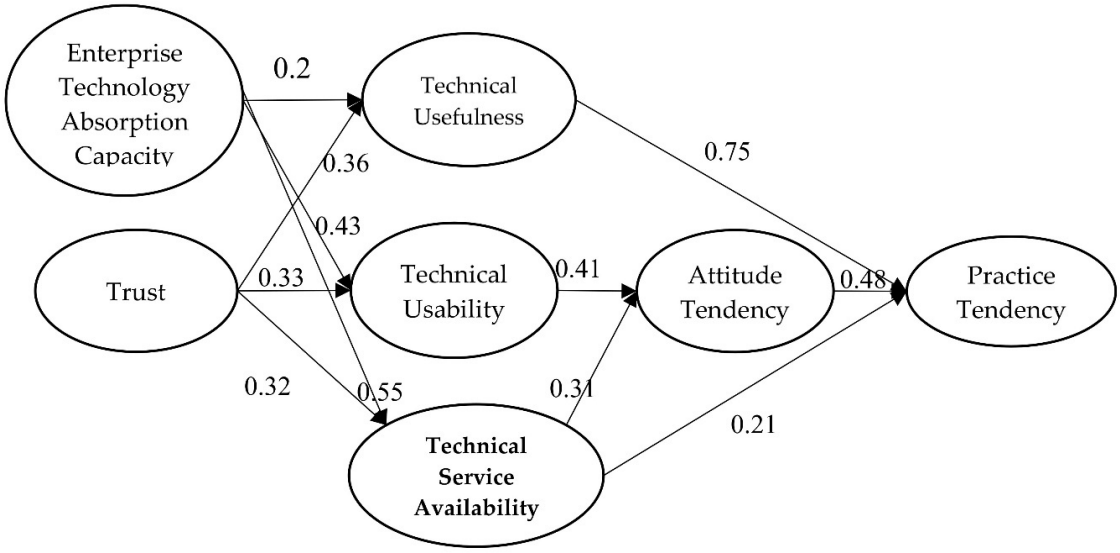

Figure 3. Mediating effect of an inventor's technical service.

Technical usefulness has a significant positive impact on long-term cooperation practice tendency; the influence path coefficient is 0.75, and there is no significant positive impact on long-term cooperation attitude tendency. Technical usability has a significant positive impact on long-term cooperation attitude tendency; the path coefficient is 0.41, and there is no direct and significant impact on long-term cooperation practice tendency. This is in line with the reality of the university's technical characteristics and technology transfer. As technology is a resource scarcity and monopoly, the usefulness of technology directly determines the technical cooperation decision of the enterprise. If the university technology is useful, the enterprise will decide to cooperate with the university. Compared with the technology related to independent research and development by enterprise, there is a certain distance between university technology and enterprise needs. After university technology transfer, enterprises often need further technology commercialization to successfully transform and apply university technology. Technology usability represents the difficulty of commercializing technology. Similar to the TAM model, the higher the usability of the technology, the higher the attitude tendency of long-term cooperation, and the higher the practice tendency of long-term cooperation. Attitude tendency has a significant positive impact on practice tendency, and the influence path coefficient is 0.48. However, technical usability has no direct effect on the practice tendency of long-term cooperation. Long-term cooperation practice tendency depends on technology usefulness, long-term cooperation attitude tendency, and the availability of technology services.

The availability of technical services has a significant positive impact on attitude tendency and practice tendency. The influence path coefficients were 0.31 and 0.21, respectively, indicating that in the process of university technology transactions, tacit knowledge service will positively affect the attitudes and decisions of technology consumption by enterprises. The higher the availability of technical services, the higher the enterprise's expected utility and expected return, the more motivation that the enterprises have to participate in the university technology transfer activities, the greater possibility of positive behavior, the greater possibility that a long-term technical cooperation mechanism will be established, and the higher the sustainability of the university technology transfer. Through the comparison of the influence coefficient, it can be seen that although the impact of the availability of technical services is very significant, the most influential factors for long-term cooperative practice tendencies are technical usefulness, attitude tendency, and the availability of technical services. Meanwhile, the greatest impact on long-term cooperative attitude tendency is technical usability, followed by the availability of technical services.

Enterprise technological absorptive capacity has a significant positive impact on technology usefulness, technical usability, and the availability of technical services, and the path coefficients are 0.23, 0.43, and 0.55, respectively. Trust has a significant positive impact on technology usefulness, technical usability, and the availability of technical services, and the path coefficients are 0.36, 0.33, and 0.32, respectively. That is to say, enterprise technology absorptive capacity and trust influence long-term cooperative practice tendency by influencing technical usefulness and technical service availability, and also influence long-term cooperative attitude tendency by influencing technical usability and availability of technical services.

On the whole, the related assumptions of enterprise technology transfer acceptance expansion model have been verified, except that the impact of the trading environment on the availability of technology services is not significant. This may be because in recent years, the central and local governments of our country have intensively introduced various policies to promote the transformation of scientific and technological achievements in universities, and the policy also requires colleges and universities to issue corresponding implementation measures according to their own circumstances. These policies and measures have a direct impact on the market environment of technology trading in universities. Taking universities in Xi'an as an example, Xi'an has become a pilot city for comprehensive innovation and reform experiments, and colleges and universities in Xi'an have pushed forward the implementation of policies such as "Shaanxi Nine rules". One after another, the corresponding policies have been introduced intensively to continuously improve the environment of the technology trading market in the aspects of opening the information on technological achievements, simplifying the administrative procedures for transfer, and implementing the reform of "three powers" in the transformation of achievements. However, since the policy is still in its early stages, there are differences in the cognition and evaluation of the related policies of different enterprises, which makes the impact of the trading environment on the availability of technical services not significant.

4. Conclusions

In order to link the existing research on sustainable development and tacit knowledge transfer, and study the important role of tacit knowledge technology service in the sustainability of university technology transfer, based on the TAM model, this paper had constructed a university technology transfer sustainable development model that considers the inventor's technology service. It used the long-term attitude tendency and long-term practice tendency of enterprises to measure the sustainability of university technology transfer, as well as the data of 270 enterprises questionnaires, to analyze the mediating effect of an inventor's technology service on university technology transfer sustainability. It was found that an inventor's technology service availability had a significant positive impact on the attitude tendency and practice tendency of enterprise long-term technological cooperation; enterprise technology absorption capacity and trust between a university and an enterprise had a significant influence on an inventor's technical service availability. Therefore, an inventor's technology service

played an important role in university technology transfer sustainability, and acted as a mediator in the relationship between university technology transfer sustainability and influence factors.

According to the results of the empirical analysis, in order to improve the sustainability of university technology transfer, the university should establish a technology transfer mode that focuses on service, attaches importance to the process of transfering technical tacit knowledge, integrates the tacit knowledge technology service provided by the inventor with the service of achievements transformation and science and technology services provided by the university, and enhance enterprises' awareness of the tacit knowledge technology services in universities. First, on the cognitive level, we should attach importance to the knowledge ability of a university's technical transfer office. For example, the office ought to know how to: identify the technology absorptive capacity of technical potential users and the technical service ability of the inventor, help enterprises obtain technical resources for the further development of technology, help the inventor improve the technology knowledge service capability, and establish extensive long-term cooperation mechanisms with enterprises through technical services. Second, on the practical level, the staff of the university technical transfer office should keep close contact with the inventor, grasp the technical service ability of the inventor, understand the technological demand, technology absorption capacity, and technical service demand of the enterprise, assist the enterprise with finding technical resources and technical service resources, help the inventor instruct graduate students providing technical services for the enterprise, assist the inventor with carrying out technical training and technical consultations, and assist the inventor and the enterprise with establishing a long-term and effective cooperative mechanism.

The government should optimize the policy system to promote the sustainability of university technology transfer. This ought to include: refining technical transfer-related policies, in particular policies related to technical service activities and transferring, establishing a long-term coordination mechanism for the transformation of scientific and technological achievements, increasing the publicity and guidance of technical transfer models, and supporting universities and inventors with carrying out technical service activities.

This study arrived at the expected conclusions, but there are still some limitations. This paper assumes that technology transfer recipients will voluntarily receive knowledge without considering the impact of enterprise attitude. Future research can analyze the influence of enterprises on the sustainability of university technology transfer, and further expand the theoretical model of university technology transfer sustainable development. In addition, this paper selects enterprise in Xi'an city as the research object, and does not consider the influence of regional factors on the sustainability of university technology transfer. Future research can select enterprises in different regions as the investigation object, and analyze the influences of economic development level and regional culture on the sustainability of university technology transfer.

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