

The Influence of the Organizational Structure of UTTOS

-- Based on the Perspective of Organization Theory

Junjie Peng*

Shanghai Normal University, Shanghai 200030, China

Abstract

In the era of globalization and rapid development, technological innovation is becoming more and more important. Although there have been many researches on technological innovation, the research on technological innovation organizations in domestic universities is still based on empirical analysis and lacks theoretical research. Therefore, this paper uses organizational theory as a research perspective to explore organizational structure, knowledge transfer channels and advanced technology. Transfer the relationship between organizational performance. The study found that the degree of organizational centralization, degree of formalization, and organizational integration capabilities have a significant impact on the innovation performance of university technology transfer organizations, and the degree of organizational centralization, degree of formalization, and organizational integration capabilities of knowledge transfer channels have a significant impact on the innovation performance of university technology transfer organizations. There is a partial mediating effect in the impact.

Keywords

Organizational Structure; University Technology Transfer; Knowledge Transfer Channels; Organization Theory.

1. Introduction

With the intensification of the US technology blockade against China, China has paid more and more attention to scientific and technological innovation. The Central Committee of the Communist Party of China put forward the strategy of "innovation is the first driving force for development", and as an institution for knowledge creation and knowledge diffusion, universities are not only the creation base of knowledge and talents, but also an important source of technological innovation [1]. Its innovation achievements are also more and more concerned, and it is hoped that universities can transform their innovation achievements into products that can be used in the market through technology transfer. President Xi Jinping also put forward in the report of the 19th National Congress of the Communist Party of China: "Deepen the reform of the scientific and technological system, establish a technological innovation system with enterprises as the main body, market-oriented, and in-depth integration of production, education and research, strengthen support for innovation of small and medium-sized enterprises, and promote scientific and technological achievements. Transformation." Building an innovative country and realizing the transformation of scientific and technological achievements is an urgent issue. However, according to the Ministry of Education's "Compilation of Science and Technology Statistics of Colleges and Universities in 2019", in 2019, the number of patents granted to colleges and universities in my country totaled 184,934, but the number of contract transfers was only 6,115, and the patent conversion rate was 3%. The patent conversion rate of China has increased, but it is still far from the conversion rate of about 12% in universities in developed countries such as the United States. In addition,

according to a survey conducted by the State Intellectual Property Office, the implementation rate of patent transformation in Chinese universities is generally lower than the national average, which is highlighted by the lack of professional technical organizational structure and the low level of technical patents. Therefore, in order to solve the difficult problem of technology transfer in Chinese universities and improve the efficiency and benefit of technology transfer in universities, it is necessary to conduct in-depth research on the organizational obstacles in the process of technology transfer in Chinese universities.

2. Literature Review

2.1. Evolution of TTO Organizational Structure

"technology transfer" originated in the United States and originally referred to the process of converting military scientific research that the United States spent a lot of resources on into civilian technology. Then this term has been used in many different occasions, and the earliest theory of technology transfer in our country is that Tang Yunbin quoted the definition of H. Brooks, a professor at Harvard University in the United States, that technology transfer refers to the transfer of technology in a group or organization. develop and then use it meaningfully in the work of another group or organization. It can be divided into vertical transfer and horizontal transfer [2]. According to H. Brooks understanding, "horizontal transfer" is more about the transfer of technology between departments and industries, between military and civilian use, and the expansion of the scope of application of technology ; The technology transfer work done by transforming basic research and applied research into products with commercial value and use value. In colleges and universities, technology transfer is a complex social activity related to different stakeholders. When specialized institutions responsible for technology transfer (Technology Transfer Offices, hereinafter referred to as TTOs) appeared, it gradually became an organized social activity. Organizational innovation is a need for technological or economic development in the early stage, and a response to the need for social legitimacy later [3]. The formation, characteristics and behavior of organizations are affected and restricted by the institutional environment. In the early stage, they were characterized by diversification and heterogeneity. Due to competitive pressures and institutional demands, they must exhibit consistency and convergence [4]. The management style and internal governance structure of TTOs are the keys to their success [5], but studies focusing on performance evaluation rarely pay attention to the differences in organizational structure. By analyzing the microscopic behavior of an organization of a heterogeneous research object, we can grasp the basic laws and characteristics of the survival and development of this type of organization from a macroscopic perspective [6].

Neo-institutionalism theory provides analytical ideas for the discussion of organizations and institutions. Institutions consist of a set of basic principles, models, rules and classifications that influence actors and their behavior. There are three ways to influence organizational convergence: (1) Coercive isomorphism, which is based on the influence of top-down political factors, and the organization develops according to the requirements of national laws; (2) Imitative isomorphism, which is influenced by bottom-to-bottom (3) Normative isomorphism, which refers to promoting the organization to change according to the normative standards of the industry [7]. Institutional school has conducted many studies on formal organizations such as enterprises, social organizations, schools, publishing houses and television stations [8]. Poglajen studied TTOs and other organizations. The organizational characteristics and heterogeneity of TTOs were observed from six aspects, including sex (exclusivity), professionalization, and funding , which contained the logical relationship between organizations and institutions [9]. Weber believes that bureaucracy should be the mode owned by a formal organization [10]. Alexander et al believe that TTOs work in four categories: the

management of research projects, the provision of knowledge services, the promotion of personnel mobility and the formation of knowledge networks, intellectual property and entrepreneurial services. According to the different tasks and development strategies of TTOs, the focus of the core competitiveness of each institution is also inconsistent [11].

On this basis, Schoen et al. classified 16 TTOs in six European countries from four dimensions: (1) the degree of subject specialization, whether the service field of TTOs is limited to a special subject area; (2) the degree of task specialization, According to the content of technology transfer activities, it is divided into: full comprehensive type (R&D funding, intellectual property management, derivative enterprise services), pre-integrated type (intellectual property management, derivative enterprise management) and post-integrated type (R&D funding and intellectual property management)); (3) the level of independence and self-government, whether it belongs to the administrative system of the university or an entity with independent legal personality; (4) the degree of exclusivity, whether it serves only one university; and summarizes the last four types, namely traditional type, independent type, subject-integrated type, subject-specialized type [12]. The analytical framework established by Schoen et al. provides an effective analytical tool for studying the heterogeneity of the governance model and organizational structure of TTOs. The disadvantage is that it does not examine the impact of external environment and internal cultural factors on TTOs, and regards it as a This kind of static structure and closed system makes this kind of research lack dynamic vision.

2.2. Research on TTO s by Organization Theory

Economists began to study organizational structure very early. In 1962, Chandler proposed that enterprises with obvious differences in organizational structure are defined as functional (or centralized) (U) and multi-departmental (M) [13]. The U-shape has obvious centralized characteristics, and the decision-making and coordination rights are determined by a small number of senior managers; the M-shape is characterized by decomposing various important functions into specific operating departments with semi-autonomous powers. In 1975, Williamson added two other organizational types of firms: holding (H) and matrix (MX) [14,15]. Similar to the M type, the H type also decomposes functions into various sub-departments, but there is a general office with relatively weak control to manage them; the MX type refers to an organizational structure type with more than two functions. The organizational relationship among various organizations within an enterprise is the key to forming the differences in the characteristics of the above-mentioned four types of organizational structures. As an emerging organizational model, studying the organizational structure of TTOs helps to understand its governance structure, internal attributes, operation mode and management method. TTOs of different organizational types have great differences in information processing ability, coordination ability and incentive mechanism, and these all have an important impact on the operation efficiency of technology transfer. In their study of patent activities in UK research universities, Meyer et al. pointed out that the differences in the organizational structure of university technology transfer offices undoubtedly have a great impact on schools' IP policies, strategies and practical activities, making schools in the field of intellectual property rights. The cost of commercial development, path selection and type of technology transfer projects vary widely from one country to another [16].

Inspired by organizational theory, scholars have paid more and more attention to the role of TTOs in promoting the transformation of university achievements, the transformation efficiency and its influencing factors, and the transfer mechanism. In terms of the role of TTOs, Etzkowitz et al systematically analyzed the technology transfer layout among universities, government and industry, pointing out that the technology transfer process of universities does not rely entirely on the government's disorderly guidance or non-communication, but mutual

Overlapping and interacting, presenting a dynamic "triple helix" process [17]. Markman et al believe that the technology transfer office with stronger ability is more able to determine the appropriate licensee through less business contact than the technology transfer office with weaker ability [18]. However, Powers et al believe that if the technology transfer office adheres to the principle of convenience and will sign a power of attorney agreement with enterprises interested in the technology, the matching degree between the technology and the licensor will be very poor. The second is the timing of engaging with the authorized person. It is necessary to identify the licensee early in order to customize the accurate patent terms according to the commercial interests of the licensee, and effectively improve the success probability of technology licensing transactions [19]. In terms of performance research, the process from university technology innovation to technology transfer mainly involves industry, researchers and TTOs, and TTOs play a key role in affecting the commercialization performance of university technology innovation [20]; TTOs conducted research and found that through technology licensing, the establishment of spin-off companies and knowledge gathering activities near universities, TTOs have a positive impact on university technology transfer performance [21]; Transfer is an evolution process at different levels, and the influence mechanism of different levels on the technology transfer process is analyzed. Dosi Giovanni first proposed that the technology transfer process can be divided into three levels macroscopically: intangible knowledge, or the transfer process of software; tangible knowledge, or the transfer process of hardware; the transfer process that exists in the information flow between the participants in technology transfer. , the three levels complement each other, promote each other and form the overall framework of technology transfer [22]. And later Dosi Giovanni further proposed that in the actual operation of technology transfer, there are three progressive levels, namely: general, general and supportive knowledge level transfer; specific and systematic knowledge level transfer and specific and proprietary knowledge level transfer. Sexual knowledge level transfer. And further pointed out that the process of technology transfer requires the investment of human and resources, which constitutes the endogenous environment of technology transfer, whether it is the horizontal transfer of countries, regions and enterprises, or the transfer of knowledge from universities and research institutes to the real economy. The knowledge level is transformed into the "deformation" of personality [23].

2.3. Domestic Research on Technology Transfer Organization in Colleges and Universities

Domestic research on technology transfer organizations in colleges and universities is less in terms of theoretical contributions, and more is focused on the analysis of the operation mode of technology transfer offices in well-known foreign universities and the experience of Chenggong, the problems existing in the construction of domestic university technology transfer offices and their solutions. Wait. Specifically, Long Yuntao conducted research on the Technology Licensing Office of Stanford University in the United States, studied the entire process of transforming its technological innovation achievements into market products, and combined with the problems that have arisen in the current technology transfer process of Chinese universities. The technology transfer method focusing on patent marketing, establish a personnel performance appraisal system; secondly, formulate detailed and perfect income distribution policies; thirdly, strengthen the training of professional talents; fourthly, establish a school-enterprise exchange and cooperation platform; fifthly, select scientific and technological topics To face the international preface; Sixth, to establish a sharing platform between institutions of higher education technology transfer [24]. Xu Wen also conducted research on the technology transfer institution of Stanford University. He believes that in order to achieve transformation and development, Chinese universities should do a good job of top-level design, determine the orientation of running a school, take the initiative to make a

difference, build a transformation and development system, adhere to reform and innovation, and lead local industries. Development [25]. Similarly, Wu Wei, Yang Wei and others conducted a comparative study on the technology transfer model of Oxford University [26,27]. Starting from the operation mode and experience of Japanese university technology transfer institutions, Li Xiaohui and others discussed its enlightenment for accelerating the transformation of scientific and technological achievements in universities in China [28]. For the empirical analysis of technology transfer in China's universities, Mei Shu'e and others believed that the obstacles to the transformation of technological achievements in China's universities mainly lie in three aspects, namely the differences in the characteristics and conditions of technology transactions, the differences between scientific research work and innovation activities, and the absorption of technology by Chinese enterprises. Differences in ability [29]. Guo Dongni believes that the four modes of technology entrepreneurship mode, transfer platform mode, university promotion mode and technology incubation mode are the technology transfer modes of our country's colleges and universities, and the analysis of the four modes shows that the complexity of the applicable technologies is different, and the transfer process The risks, thresholds, channels and difficulties are also different [30]. Zhang Chunbo conducted research on 32 "985 Project" universities and found that the patented technologies of universities can be summarized as the operation of school asset management entities, direct technology transfer, local school research institutes, professional management entity operations, school-enterprise joint research and development, and academic entrepreneurship mode [31]. Fan Bainai took colleges and universities in 31 provinces and cities in China as the research object, and examined their regional differences, and found that the technology transfer efficiency of Chinese universities is generally low, and the gap between provinces is large [32]. Liu Qunyan and Yao Yu used factor analysis and correlation analysis to analyze 34 colleges and universities directly under the Ministry of Education of China, and believed that there was a certain correlation between the organizational management behavior of colleges and universities and technology transfer performance, and the assessment and evaluation management in them significantly promoted technology transfer performance. Role [33]. From the perspective of organizational boundaries, Xu et al. discussed the defects of China's technology transfer institutions, and proposed that China's technology transfer institutions should combine the practical experience of the boundary organization model, and proceed from the actual needs of China's scientific and technological innovation to build a technology transfer institution with a boundary organization model [34]. Duan Xiaomei studied the expenditures and technology transfer income of colleges and universities, and found that there was a significant nonlinear relationship between the expenditures of applied research funds and the income of technology transfer in colleges and universities, and there was an inverted U-shaped relationship between them. There is a double threshold effect in the technology transfer income of colleges and universities. When the applied research expenditure as a threshold variable exceeds the first threshold value, it can significantly increase the technology transfer income of colleges and universities; The role of technology transfer income is significantly weakened [35]. Wu Wei et al. took five "double first-class" universities as examples to discuss how to remove technical barriers, and proposed that management barriers should be removed by reducing the complexity and uncertainty of internal management; by building external networks, acquiring external resources across borders, and improving Resource allocation efficiency; overcoming cultural barriers through information translation and personnel empowerment [36]. Liu Qunyan conducted research on the T TO s of Shanghai Jiao Tong University, and proposed to promote the effective improvement of the transfer and transformation of scientific and technological achievements through governance concepts, decision-making mechanisms, innovative culture and model innovation.

From the above review, it can be seen that foreign research on technology transfer organizations is relatively mature, and although there are many domestic studies, most of them discuss the model and efficiency of technology transfer institutions based on empirical evidence, and discuss technology transfer institutions from a theoretical point of view. There are few studies on the model, so this paper is based on organizational theory and takes the knowledge transfer channel as the mediating variable to explore the impact of organizational structure on the organizational performance of technology transfer. The transfer organization reform has practical reference significance.

3. Theoretical Basis and Research Assumptions

3.1. Related Concepts

Organizational structure: Based on bureaucracy, behavioral school, flexibility and situational school, existing research has defined many concepts of organizational structure, but generally it is inseparable from the framework of how to divide, group, coordinate and cooperate with work tasks. This study adopts the concept of Guo Lin, Padrexia, etc. to define organizational structure: organizational structure refers to the formal arrangement of work roles in an organization and the mechanism for managing and integrating work including cross-organizational activities [37].

Organizational performance: Organizations referred to in this study are classified as "work teams" and are positioned to produce "new knowledge," or to apply knowledge in an entirely new way to achieve significant, novel, and creative innovations. The definition of the organization in this study comes from Loch and Tapper: the "R&D team" of an enterprise often faces a high degree of uncertainty in R&D work, so both the process or results of R&D should be included in the scope of performance measurement [38].

Knowledge transfer channel: The knowledge transfer channel is considered as the medium and path for the transfer between the knowledge receiver and the sender. If the knowledge transfer channel does not exist, then the knowledge transfer cannot happen [39]. This is because knowledge in a certain environment can be transferred to other environments requires the cooperation of appropriate transfer mechanisms, organizational settings, etc. Their existence constitutes a prerequisite for knowledge exchange, so knowledge transfer channels are an inevitable "organizational input". The richer the knowledge transfer channels, the more it can promote the knowledge transfer between all levels within the organization (here refers specifically to the knowledge transfer of university technology transfer organizations).

3.2. Research Hypothesis

Whether it is Spender's assertion that an enterprise is a knowledge system [40] or Wei Jiang's assertion that it is a knowledge platform [41], the organizational structure is regarded as its organizational support layer. As an important carrier of enterprise knowledge, organizational structure affects the knowledge structure of an enterprise, supporting and optimizing the stock and flow of knowledge; as an important channel for knowledge transfer, organizational structure provides an organization for the transfer of knowledge, especially tacit knowledge. platform. Highly centralized, formalized firms mean that knowledge transfer occurs only in subordinate sectors with It is impossible to carry out between the superior departments, and it is impossible to carry out between various subordinate departments [42], which is actually a fixed single- path transfer, rather than a multi-directional network transfer. In a flat, organic organization, fixed, vertical channels of knowledge and information exchange are replaced by multi-dimensional, two-way channels of information exchange. The strong integration ability of an organization can also be regarded as its role as a structural hole , linking two unrelated departments or teams in the organization together and acting as a "bridge". Studies have

pointed out that this connection provides the possibility of obtaining unique information [43]. It establishes a bond between teams and organizations, and this bond can also be regarded as a horizontal knowledge transfer channel. It is different from the vertical knowledge in traditional organizations, which cannot effectively solve the uncertain risks faced by the R&D team. Through the horizontal knowledge transfer channel constructed by organizational integration, the R&D team can obtain reliable information and enhance the level of mutual trust, avoiding uncertainty risks [44]. Therefore, based on the above discussion, this study proposes the following hypotheses:

H1a: The more centralized the organizational structure of technology transfer in universities, the worse its performance.

H1b: The more formalized the organizational structure of university technology transfer, the worse its performance.

H1c: The better the integration ability of the organizational structure of technology transfer in universities, the better its performance.

H2b: The organizational structure of technology transfer in universities tends to be more centralized, and the knowledge transfer channels of R&D teams are more single.

H2a: The more formalized the organizational structure of technology transfer in colleges and universities, the simpler the knowledge transfer channels of the R&D team.

H2c: The better the integration capability of the technology transfer organizational structure in universities, the richer the knowledge transfer channels of the R&D team.

H1d: The richer the knowledge transfer channels of university technology transfer organizations, the better their performance.

H3: Knowledge transfer channels have a mediating role between organizational structure and organizational innovation performance.

4. Research Methods

4.1. Data Sources

In this study, questionnaires were distributed to five 985 colleges and universities, Sichuan University, Chongqing University, Wuhan University, Beijing Normal University and Hunan University. The reasons for choosing these five universities are firstly because these five universities are all 985 universities, and their technology transfer organizations are relatively complete; secondly, because the author is familiar with these five universities, it is more convenient to distribute the questionnaires. After the questionnaires were recovered, the questionnaires that did not meet the requirements were eliminated, and 145 valid questionnaires were obtained, with an effective recovery rate of 80.6%.

4.2. Determination of Variables

The scale of organizational structure is modified on the basis of the design scale of Wanyi W (1999), which determines the degree of centralization and decentralization, the degree of formalization, and the degree of departmental integration, and sets 14 questions. Measured by a five-point Likert scale.

The measurement of innovation performance is based on the oldham and cummings scales, and 7 questions are set. The questions include: the project team often adopts new product components and service items; the project team implements new methods that can improve team performance ; Measured by the Likert five-point scale; the project team often introduces new technologies that can improve the work process; the project team will change the service items or improve the service method according to the needs of external feedback; the project team can often develop Some products or services that can be accepted by the market; the

project team often adopts some methods that can improve product performance or operation process.

The knowledge transfer channel is based on the research of scholars such as Brennenraedts and Albino, etc., and sets 7 questions, including: you communicate with the superiors and subordinates of your adjacent departments (teams), and you can get their feedback in time; 4. When you communicate with employees in your adjacent department (team), you can get their information feedback level in time; your team directly communicates with you from superiors and subordinates to get your information feedback level in time; your adjacent department (team)) employees communicate with you and can get your information feedback level in time; the superiors and subordinates of your adjacent department (team) communicate with you and get your information feedback level in time; your team directly communicates with you. Level communication, can get their information feedback level in time.

It can be seen from Table 1 that the Cronbach's coefficient of each scale is 0.766 to 0.873, which are all greater than 0.7, so each scale is relatively reliable. At the same time, the confirmatory factor analysis (see Table 2) shows that the model fit is good.

Table 1. Questionnaire Cronbach's Coefficient Test

variable		number of questions	Cronbachps alpha coefficient
Organizational structure	Degree of Centralization and Decentralization	4	0.766
	degree of formality	6	0.820
	Department integration	4	0.862
	Knowledge transfer channels	6	0.853
	innovation performance	6	0.873

Table 2. Confirmatory factor analysis for each variable

index	χ^2 / df	GFI	RMR	RMSEA	NFI	CFI	IFI
organizational structure	2.06	0.96	0.04	0.07	0.95	0.99	0.96
Knowledge transfer channels	2.70	0.95	0.05	0.10	0.97	0.97	0.97
innovation performance	2.88	0.97	0.04	0.09	0.98	0.98	0.98

4.3. Research Methods

This paper adopts the method of hierarchical regression to investigate the relationship between organizational structure, knowledge transfer channels and organizational performance, and to explore the mediating effect of knowledge transfer channels. Its model is as follows:

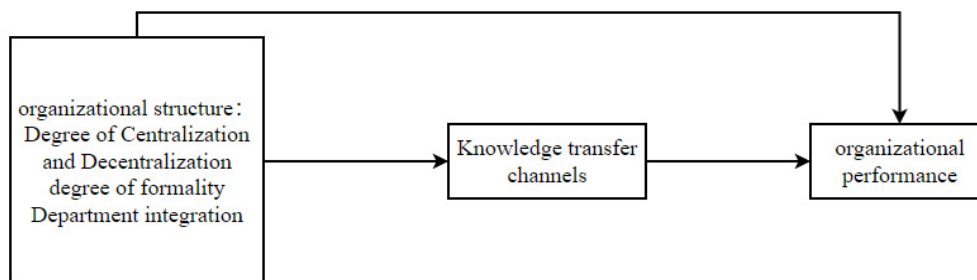


Figure 1. Research model

5. Research Results

5.1. Descriptive Statistical Analysis

From Table 3, the mean of the degree of centralization and the mean of the degree of formalization is 3.21, the mean of the departmental integration ability is 3.26, the mean of the knowledge transfer channel is 3.48, and the mean of the innovation performance is 3.36. The standard deviation of the degree of centralization is 0.75. The standard deviation of the degree of formalization is 0.79, the standard deviation of departmental integration capacity and knowledge transfer channel is 0.74, and the standard deviation of innovation performance is 0.77.

Table 3. Descriptive Statistical Analysis of Variables

variable	Number of samples	mean	SD
Degree of Centralization and Decentralization	145	3.21	0.75
degree of formality	145	3.21	0.79
Departmental Integration Capability	145	3.26	0.74
Knowledge transfer channels	145	3.48	0.74
innovation performance	145	3.36	0.77

5.2. Hypothesis Testing

Table 4. The regression coefficient analysis of organizational structure and innovation performance

Model		Unstandardized coefficients					
Explained variable	Explanatory variables	B	standard error	Beta	T	Sig.	Adjusted R2
innovation performance	Degree of centralization	0.789	.106	.686	11.264	.000	.470
innovation performance	degree of formality	-.754	.071	-.664	10.610	.000	.440
innovation performance	Integration	0.826	.109	.655	10.367	.001	.429
innovation performance	Knowledge transfer channels	.884	.058	.785	15.153	.000	.616

It can be seen from Table 4 that when the degree of centralization is used as the independent variable and innovation performance is used as the dependent variable, the non-standard coefficient of the degree of organizational centralization is 0.789, the standardized coefficient is 0.686, and the significance is $0.000 < 0.005$. Therefore, from the regression equation, the degree of organizational centralization has a positive correlation with the innovation performance of university technology transfer institutions, that is, the greater the degree of centralization, the better the organizational innovation performance. Similarly, it can be seen that the degree of organizational formalization has a negative correlation with the innovation performance of university technology transfer institutions, while the organizational integration capability has a positive correlation with the innovation performance of university technology

transfer institutions. Therefore, the hypothesis H1 a does not hold, while the assumptions H1b, H1c and H1d hold.

It can be seen from Table 5 that the knowledge transfer channel of the mediating variable has a correlation with the independent variable degree of centralization, the degree of formalization and the organizational integration ability, which verifies the hypothesis H2 a , H2b , H2c ; at the same time, it can be seen from Table 4 that the degree of centralization, Both the degree of formalization and the ability of organizational integration have an impact on the innovation performance of technology transfer organizations in colleges and universities; finally, it can be seen from Table 6 that the independent variables, the degree of centralization, the degree of formalization, the ability of organizational integration and the intermediary variables, the knowledge transfer channels and the regression results of technology transfer organizations in colleges and universities , it is found that the regression coefficient of the independent variable is significant, indicating that the mediation effect is significant, and it is a partial mediation. Therefore, the H3 hypothesis holds.

To summarize the above, it is assumed that H1b, H1c, H2a, H2b, H2c and H3 are established, but H1a is not established, but the degree of centralization has a positive impact on the innovation performance of technology transfer organizations in universities.

Table 5. Regression coefficient analysis of organizational structure and knowledge transfer channels

Model		Unstandardized coefficients					
Explained variable	Explanatory variables	B	standard error	Beta	T	Sig.	Adjusted R2
Knowledge transfer channels	Degree of centralization	0.822	.096	.664	10.608	.000	.440
Knowledge transfer channels	degree of formality	-.761	.055	-.755	13.775	.000	.570
Knowledge transfer channels	Integration	0.933	.075	.808	16.425	.000	.654

Table 6. Regression coefficient analysis of organizational structure, knowledge transfer channels and innovation performance

Model		Unstandardized coefficients					
Explained variable	Explanatory variables	B	standard error	Beta	T	Sig.	Adjusted R2
innovation performance	Degree of centralization	.511	.113	.294	4.532	.000	0.665
	Knowledge transfer channels	.664	.073	.590	9.078	.000	
innovation performance	degree of formality	-.187	.089	-.165	2.112	.003	0.628
	Knowledge transfer channels	.744	.088	.660	8.458	.000	
innovation performance	Integration	.101	.152	.059	.668	.001	0.617
	Knowledge transfer channels	.831	.099	.737	8.361	.000	

6. Research Conclusions and Research Prospects

6.1. Research Conclusions

The three dimensions in the organizational structure have a significant impact on the innovation performance of technology transfer organizations in colleges and universities.

According to the previous research, it can be concluded that the higher the degree of organizational centralization, the higher the organizational innovation performance, which seems to be inconsistent with common sense, which may be related to the selection of universities and the particularity of technology transfer organizations in universities. There is not too clear assessment, so a highly centralized university technology transfer organization may promote the enthusiasm of researchers, but whether this is the case requires further research. And when the organization is more flexible and the integration ability is stronger, the innovation performance of university technology transfer organization is higher. Therefore, university technology transfer organizations should strengthen the construction of organizational flexibility and integration capabilities.

Knowledge transfer channels have a significant impact on the innovation performance of technology transfer organizations in colleges and universities.

This study shows that knowledge transfer channels have a positive and significant impact on the innovation performance of technology transfer organizations in colleges and universities, that is, when the knowledge transfer channels are more abundant, the innovation performance of technology transfer organizations in colleges and universities is higher, so the R&D team of technology transfer organizations in colleges and universities should absorb more Disciplinary and multi-background knowledge, recruit interdisciplinary talents, integrate knowledge under the mutual penetration of various knowledge, and form a multi-channel technology transfer channel.

Knowledge transfer channels have a mediating effect on the influence of organizational structure on the innovation performance of technology transfer organizations in colleges and universities.

This study found that knowledge channels have a partial mediating effect between the degree of organizational centralization, the degree of organizational formalization, the ability of organizational integration, and the organization of technology transfer in colleges and universities. This research complements the domestic research on technology transfer organizations in colleges and universities, and discusses the impact of organizational structure on the innovation performance of college technology transfer organizations and the mediating effect of knowledge transfer channels from the perspective of organizational theory. cause research.

6.2. Research Deficiencies and Prospects

First of all, the schools selected in this paper are not selected by random sampling, so the representativeness of the data will be reduced. Second, due to time and economic relations, the number of questionnaires issued is also insufficient, so the accuracy of the research conclusions will also be reduced. somewhat reduced. In the following research, we can further consider extending and improving the existing model, adding other independent variables and control variables.

References

- [1] C.B. Zhang, Y. Yang, K. Ding, et al.: Analysis and Prospect of Patent Technology Transfer Mode in Chinese Universities: Taking 985 Project Universities as an Example, *Journal of Science and Technology Progress and Countermeasures*, Vol. 33(2016) NO.6, p.117-121.
- [2] Y.B. Tang: Economic problems in technology introduction should be studied, *Journal of World Economy*, Vol. 1(1978), p.69-71.
- [3] P. S. Tolbert, , L.G. Zucker: Institutional sources of change in the formal structure of organizations: the diffusion of civil service reform, *Journal of Administrative Science Quarterly*, Vol. 28(1983) NO.1, p. 22-39.
- [4] P. J. DiMaggio, W. W. Powell: The iron cage revisited: Institutional isomorphism and collective rationality, *Journal of American Sociological Review*, Vol. 42(1983) NO.2, p.147-160.
- [5] J. Bercovitz, M. Feldman: Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development, *Journal of Technology Transfer*, Vol. 31(2006) NO.1, p. 175-188.
- [6] Y.H. Lian, R.P. Mu: Organizational Behavior Research on the Transformation of National Engineering Research Center, *Journal of Research management*, Vol. 20(1999) NO. 1, p.1-8.
- [7] P. J. DiMaggio, W.W. Powell: Introduction. In *The New Institutionalism in Organizational Research*, ed (University of Chicago Press, Chicago 1991).
- [8] Y. Guo, Y. Xu, X. Chen: New Institutionalism: Theoretical Storytelling and Its Contribution to Organizational Research, *Journal of Society*, Vol. 1(2007) No. 27, p.14-40.
- [9] M. Poglajen: University–Industry Knowledge and Technology Transfer: Isomorphism of university technology transfer organizational units, *The DRUID Society Conference (Copenhagen, Denmark, 2012)*.
- [10] M. Weber: *The Theory of Social and Economic Organization* (The Free Press, New York).
- [11] A. T. Alexander, D.P. Martin: Intermediaries for open innovation: A competence-based comparison of knowledge transfer office practices, *Journal of Technological Forecasting & Social Change*, Vol. 80(2013), p. 38-49.
- [12] A. Schoen, B. P. Potterie, J. Henkel: Governance typology of universities ' technology transfer process, *Journal of Technology Transfer*, Vol. 39(2014), p.435-453.
- [13] A. Chandler: *Strategy and Structure: Chapters in the History of the American Industrial Enterprise* (The M. i. T. Press, Cambridge 1962).
- [14] O. Williamson: *Markets and Hierarchies: Analysis and Antitrust Implications* (The Free Press, New York).
- [15] O. Williamson: *The Economic Institutions of Capitalism* (The Free Press, New York 1985).
- [16] M.S. Meyer, P. Tang: Exploring the "Value" of academic patents: IP management practices in UK universities and their implications for Third-Stream indicators, *Journal of Scientometrics*, Vol. 70 (2007) No.2, p.415-440.
- [17] H. Etzkowitz, L. Leydesdorff: The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations, *Journal of Research Policy*, Vol. 29(2000).
- [18] G. Markman, P. Gianiodis, P. Phan, et al.: Innovation speed: Transferring university technology to market, *Journal of Research Policy*, Vol. 34(2005) No.7, p.1058-1075.
- [19] J.B. Powers, P. McDougall: Policy Orientation Effects on Performance with Licensing to Start-Ups and Small Companies. *Journal of Research Policy*, Vol. 34(2005) No. 7, p.1028-1042.
- [20] A. Stevens, F. Toneguzzo, D. Bostrom: *Autm US Licensing Survey: Fy 2004 Survey Summary*, *Journal of Social Science Electronic Publishing*, 2009.
- [21] A. Caldera, O. Debande: Performance of Spanish universities in technology transfer: An empirical analysis, *Journal of Research Policy*, Vol. 39(2010) No. 9, p. 1160-1173.
- [22] G. Dosi: *The Nature of the Innovative Process*, *Journal of technical change & economic theory*, 1988.

- [23] Sido , et al.: Technological Progress and Economic Theory (Technological Progress and Economic Theory , 1992).
- [24] Y.T. Long, F.J. Zhang, G.L. Yang: Research and Enlightenment of Stanford University Technology Transfer Operation Mode, journal of Science and Technology Management Research, Vol. 38(2018) No. 15, p,120-126.
- [25] W. Xu: The Enlightenment of Stanford University's Development Model to the Transformation and Development of Local Undergraduate Universities in China, journal of Heilongjiang Higher Education Research, (2017) No. 10, p. 70-73.
- [26] W. Wu, H. Fan, X. Yu: An Analysis of the Operational Mechanism of the Transformation of Scientific and Technological Achievements in Colleges and Universities: Taking Isis Company of Oxford University as an Example, journal of Higher Engineering Education Research, (2017) NO.4, p.115-119.
- [27] W. Yang, J. Peng, X.X. Gao, et al.: The practice and thinking of the transformation of scientific and technological achievements in Oxford University, journal of Evaluation and Management, (2015) No.4, p.35-39.
- [28] X.H. Li, D.F. He, J. Peng: The transformation mode and enlightenment of scientific and technological achievements in Japanese universities, journal of Science and Technology Herald , (2018).
- [29] M. E. Me, W.J. Zhong: Analysis of the factors that hinder the transformation of scientific and technological achievements in Chinese universities, journal of Science and Science and Technology Management, Vol. 29(2008) No. 3, p. 22-27.
- [30] D.G. Guo: Research on the Technology Transfer System in Chinese Universities, journal of Research Management, Vol. 34(2013) No.6, p. 115-121.
- [31] C.B. Zhang, Y. Yang, K. Ding, et al.: Analysis and Prospect of Patent Technology Transfer Mode in Chinese Universities - Taking 985 Project Universities as an Example, journal of Science and Technology Progress and Countermeasures, (2016) No.6, p.117-121, 5 pages in total .
- [32] B. Fan, J. Yu: Research on Regional Differences and Influencing Factors of Technology Transfer Efficiency in Universities, journal of Science Research, Vol.33(2015) No. 12, p. 1805-1812.
- [33] Q.Y. Liu, Y. Yao: Organizational Management Behavior and Technology Transfer Performance in Colleges and Universities: An Empirical Analysis Based on 34 Colleges and Universities directly under the Ministry of Education, journal of Science and Technology in Chinese Universities, (2018).
- [34] X. Xu, H. Liu, Y. F. Zhang: Innovation of Technology Transfer Organization Model--Path Expansion Based on Boundary Organization, journal of Science and Technology Progress and Countermeasures, Vol. 38(2021) No. 5, p. 1-10.
- [35] X.M. Duan: Nonlinear Research on Applied Research Expenditures and Technology Transfer Income in Colleges and Universities: An Empirical Analysis Based on Panel Data of 27 Provinces from 2003 to 2017, Journal of System Science, (2021) NO.4, P.115-119+ 125.
- [36] W. Wu, S. Meng, M.L. Xu: How to break the barriers of technology transfer? --A qualitative research based on five "double first-class" universities, journal of Science Research, (2021), p.1-18.
- [37] L. Guo, F. Patricia: Organizational Structure and Performance of Small and Medium-sized Enterprises, Journal of Xiamen University, (2005) No. 1, p. 17-21.
- [38] C.H. Loch, Tapper: Implementing a strategy-driven performance measurement system for an applied research group, Journal of Product Innovation Management, Vol. 19(2002), p. 185-198.
- [39] S. Ghoshal: The innovative multinational: a differentiated network of organizational roles and management processes(Harward Business School, New York 1986). P.18-35.
- [40] J.C. Spender: Organizational knowledge, collective practice and Penrose rents, journal of International Business Review, Vol. 3(1994), p.353-367.
- [41] J. Wei: Knowledge learning and the growth of enterprise technical capabilities (Science and Technology Press, China), p.1-7.
- [42] S. Pavel, M. Ander: Knowledge transfer within Japanese multinationals, Journal of knowledge management, Vol. 3(2006), p. 55-68.

- [43] J.E. Perry-Smith, C.E. Shalley: The social side of creativity : a static and dynamic social network perspective, *Journal of Academy of Management Review*, Vol. 28(2003) No. 1, p. 89-106.
- [44] D.X. Wang, W. X. Guo, X.L. Liu: An empirical study on the influence of the characteristics of the social network within the team on the process of team creativity. *Journal of Soft Science*, Vol. 9(2009), p.25-28.
- [45] W. Y. Wu, Z. H. Zhong, Z. X. Jiang: Research on the relationship between corporate culture, organizational operation, manufacturing strategy and business performance, *Journal of Chinese Management Review (Taiwan)*, Vol. 2(1999) No.1, p.13-34.