

# **A Study on Knowledge Innovation Approaches of Local Universities in China: Based on Perspective of Organizational Transformation**

**Chunlin Li**

School of Management  
China West Normal University, Nanchong, Sichuan  
China

**Yue Wu**

Education Science Research Institute  
Wuhan University, Wuhan, Hubei  
China

## **Abstract**

Local universities play a guiding and supporting role in regional innovation systems. External environment is an important factor of university knowledge innovation, but university organization is the basic reason of knowledge innovation. University organizational transformation makes its core task and deep structure changed and then promotes the ability of knowledge innovation in universities. Knowledge innovation in American entrepreneurial university is to play a better role of the research university in a knowledge-based society, but knowledge innovation in European entrepreneurial university is to solve social problems. Based on the analysis of university organizational transformation about American model and European model, the research shows that the main approach of knowledge innovation in local universities is to build the knowledge-based entrepreneurial area, insist on problem-oriented knowledge innovation logic and build double-centered entrepreneurial university of academic and entrepreneur.

**Key Words:** local university; knowledge innovation approaches; organizational transformation

## **1. The Problem Emergence**

The past decades have seen the world with increasingly fierce globalization competition as well as regional contend, from which the importance of innovation in the knowledge-based economy societies to enhance sustainable development and core competitiveness has been recognized by all countries in the world, constructing own national innovation system centered upon innovation. Innovation is a driving force for the sustainable development of economy. Our country is in the transitional stage from investment-driven to an innovation-driven development. The 17<sup>th</sup> CPC National Congress formally proposed the construction of an innovative country and the 18<sup>th</sup> Congress stressed the need to adhere to the road of independent innovation with Chinese characteristics, implementing innovation-driven development strategy. As showed by the knowledge innovation law in some developed countries, university is the core component of the knowledge innovation system, especially for the basic researches of the first-class research university which has become the nuclear strength to affect the original knowledge innovation in the advanced countries. Chinese policies such as “suggestions on deepening the reform of science and technology to accelerate the build of national innovation system”, “outlines of

national medium and long-term education reform and development planning (2010-2020)", and "plans on improvement of innovation ability in higher education" have been emphasizing the necessity that higher education plays an important role in the national innovation system and regional innovation system.

Local university plays an important guiding and supporting role in the regional innovation system, undertaking important missions of serving the whole society besides teaching, scientific researches with its resources and knowledge advantages and tech- innovation platform to create a good environment for regional innovation. It is very necessary not only for the university itself to promote local university knowledge innovation but also for the enhancement of regional innovation capability and promotion of regional economic and social development. Experience in the developed countries shows the enormous importance of local higher education. Taking American state universities as an example, they mainly serve for their own states, fully considering the characteristics and needs of their states when they construct the school disciplines and take scientific researches. Teaching and research activities there have played irreplaceable roles in regional economy, strongly promoting the development of the country. The initiative "outlines of national medium and long-term science and technology development planning (2010-2020)" has clearly advocated fostering a regional innovation system with distinguishing features and advantages. Another "overall plan on boosting the world first-class universities and first-class disciplines" has encouraged local governments to cultivate the world first-class universities and the first-class disciplines from local universities. Therefore, exploring knowledge innovation in the local universities not only promotes regional economic and social development, but also benefits the advancement of top-ranking disciplines in local universities.

## **2. Literature Review**

Daniel Baer believes that university is the hub of the post-industrial society which is highly dependent on the knowledge production. As the "axis" in society, university no longer just imparts knowledge traditionally, but it has been changed to be the center from being on social edge. We need to seriously think over modern universities how to create, disseminate and transform knowledge, how to effectively manage to upgrade their knowledge innovation ability. Knowledge innovation is, for scientists and engineers, the production, flow and transmission of newly inter-disciplinary, cross-industry, trans-national ideas as well as its applications in society <sup>[1]</sup>. In 1950s, university knowledge innovation has begun drawing the attention of researchers in some western developed countries. From the perspective of knowledge theory, knowledge creation, dissemination and application constitute the three stages of knowledge innovation. From the perspective of its subjects, individual ability, organizational capacity and national ability account for the three levels of knowledge innovation ability <sup>[2]</sup>. While from the perspective of organization theory, this ability includes innovation foundation, innovation intelligence, innovative consciousness, innovative methods and innovation environment <sup>[3]</sup>.

Researches on university knowledge innovation both in home and abroad are mainly conducted from two perspectives: knowledge management and knowledge network. In terms of knowledge management, researches are chiefly based on the cooperation of producing and learning together. Because of complex changes of knowledge environment in this knowledge economy society, the requirements of knowledge innovation and management for universities and research institutions are increasingly eager to be satisfied <sup>[4]</sup>. University knowledge management is to promote knowledge innovation among group members, enlarging knowledge pooling by expanding knowledge innovation to enhance its development and competition ability. University knowledge innovation mainly studies the process of produce-learn

combination and the causes which affect knowledge innovation performance. The essence of knowledge innovation is a spirally rising process, which is continuously updated and accumulated on through the formation of explicit knowledge and tacit knowledge interaction. Knowledge creation is an important part of knowledge innovation, whose process can be analyzed by Nonaka's SECI model <sup>[5]</sup>. Knowledge transmit and application themselves are a costly process of knowledge creation, and the cooperative research centers established by universities and enterprises have been regarded as an effective way to promote the relationship between industry and university. Social values of knowledge must be achieved through socialization and commercialization from university innovation knowledge and technological achievements, which is called knowledge transfer centered on university. "Three spiral" model is often used to analyze knowledge transfer among the government, the enterprise and the university <sup>[6]</sup>. Incentive mechanism, which includes knowledge creation, knowledge sharing, knowledge integration and knowledge innovation etc., is an important factor affecting the performance of knowledge innovation. Therefore, theme of the knowledge innovation study also covers the university knowledge creation capability, knowledge integration capability, the ability to attract, to transfer.

Began in 1990s, knowledge network was originally described as the organization and activities to conduct scientific knowledge production and dissemination. By building the knowledge network, cooperative relationship has been boosted between university scientific research teams and different universities or between university and other organizations to promote the knowledge transfer and sharing, to strengthen mutual cooperation and to improve the knowledge innovation ability. University knowledge innovation studies based on knowledge networking are mainly centralized on knowledge innovation between teams and organizations, of which networks of produce-learn-research can be easily found. Many studies have shown that academic researches' influence on regional innovation is greatly affected by geographical proximity, whose innovation originated in the produce-learn-research network <sup>[7]</sup>. Knowledge network among university organizations affects both regional innovation ability and its competitiveness <sup>[8]</sup>, so they have attracted much attention, which composed of researches on knowledge innovation network construction, knowledge network dynamics researches on how universities' access to scientific knowledge, knowledge innovation alliance networks and so on. From the perspective of knowledge network, the factors that affect university knowledge innovation ability are: inter-organizational network capitals, social capitals, the nature of knowledge flow, imbedibility relations, inter-organizational learning <sup>[9]</sup>. What's more, organizational knowledge innovation ability and network centrality, network density and structure hole are closely related to each other. Collaborative innovation has become a brand new model in the innovation-oriented countries to improve their innovation ability, the most important purpose of which is to motivate knowledge innovation by the integration of knowledge resources through collaboration platform (p36).

University knowledge innovation researches based on knowledge management or on knowledge network jointly place the university in the produce-learn-research cooperative community to solve problems involving knowledge innovation, and focus on external factors of university knowledge innovation ability, ignoring that university itself is a place to explore advanced knowledge. The external environment is an important factor influencing university knowledge innovation while whose root cause is its internal organization, because organization transformation itself will make changes for the core task of the university and its deep structure. Existing researches are mainly based on knowledge management theory, social network theory as well as collaborative innovation theory, but its counterparts in the organization transformation perspective are relatively fragmented. Local universities not only bear parts of the

knowledge innovation task, but also need to flexibly adjust to external environment changes through organization transformation. Therefore, how to effectively achieve knowledge innovation when the local universities are transforming remains an urgent issue for researchers.

### **3. University Organizational Transformation and Knowledge Innovation**

University functions have changes fundamentally after two academic revolutions in the history of its development. The main function of universities was to impart knowledge and provide training for few specialized occupations from the middle Ages to the end of 18<sup>th</sup> century. From the 19<sup>th</sup> century, the first academic revolution has made scientific research become another major task for university apart from normal teaching, finding out new knowledge as its new academic goal, marking that university converted to be the research university from a traditionally teaching university. The second revolution in the late 20<sup>th</sup> century has seen entrepreneurship becoming another new feather for university, applying knowledge to economy, which means that university has undertaken the task of economic development besides personnel training and scientific researches. Two academic revolutions enabled university missions' transformation, the "internal logic", from inheriting knowledge (education) to knowledge creation (scientific research) as well as its commercial application. Entrepreneurial university has become another new knowledge innovation approach with the innovation of university organization.

Although newly non-university knowledge producers continue to emerge, knowledge innovation is no longer confined to the intelligence process and it can be recreated in the process of its application, research-based university still has an absolute advantage in the knowledge innovation system due to its resource and discipline advantages. American entrepreneur-based university is a new one which was created by research universities through the combination of teaching and scientific researches and knowledge capitalization, whose dynamical mechanism of knowledge innovation was to better perform research-centered university in the knowledge society. From the perspective of history, entrepreneurial university is a multifunctional organization, creating knowledge and putting it into practice, developed from an organization of preservation and dissemination of knowledge in medieval universities <sup>[10]</sup>. And American entrepreneur universities are the leading signs featuring in knowledge transfer and academy entrepreneur, represented by Massachusetts Institute of Technology and Stanford University. From knowledge innovation, knowledge created by entrepreneurial universities has multiple values in theoretical, technical and commercial potential by adopting a linear process, that is, from teaching to research and then to promote economic development, whose innovation origin is knowledge. Essentially speaking, it is the expansion of academic research in social service and the capitalization of knowledge.

For university being involved in the tide of knowledge innovation, traditional knowledge production has been proved inappropriate. The discrepancy between the needs of external environment and universities' reaction ability strongly demands the university react as quickly and selectively as possible towards knowledge field and external changes. Entrepreneurial university in both European model and American model has similar aims, namely, to promote regional economic development and increase university research and other economic activities. However, organization transformation diverges: American entrepreneurial university mainly expands university research task, while its European counterparts in focus on teaching task <sup>[11]</sup> (p75). The famous American scholar, Burton Clark, identified 5 common elements of university organizational transformation at the end of the 20<sup>th</sup> century based on case analysis of five European innovative universities, namely, strong ruling ability, broaden periphery, diversified funding base, activated academy zone and integrated entrepreneurship culture <sup>[12]</sup>. In Burton Clark's view,

the ruling ability of some emerging universities was very weak, so it needs to be responding more quickly and flexibly to the requirements of the external environment. European entrepreneurial university is the revolutionary one in response to environmental change. University organization revolution is more likely to be nonlinear, entrepreneurship as the expansion of teaching engagement. Under this kind of model, university knowledge innovation takes society needs as starting point, actively responding to major social issues after universities have acknowledged what is needed in society. Essentially, it is universities' response to the external environment.

Three spiral theory shows that the government, industry and university are the three major elements of the innovation environment in the knowledge economy society, whose core lies in the regional scientific research institutes and universities <sup>[13]</sup>(P1-2). Compared with research-oriented university, local university has less reputation, no outstanding political influence, and no competitive advantage in terms of resources and status, which seems easier to be a margin position in the higher education reform. Although having relatively weak discipline advantage, local universities attach much importance to solving problems involved in disciplines and knowledge. In the knowledge economy society, our local universities partly undertake the mission of academic innovation, but also take the initiative to deal with the challenges caused by changes in the external environment.

#### **4. Local University Knowledge Innovation Analysis**

Local university is a main part of our higher education system, mainly relying on local government's financial support. They shoulder the responsibility of knowledge innovation and promoting regional economic and social development, whose knowledge innovation shares a high degree of consistency with transformation of entrepreneurial university. Integrating relative theories about university organization transformation in both American and European model lay the theoretical foundation to analyze our local university knowledge innovation approaches.

##### *4.1 Establish an Knowledge Innovation Area*

Three spiral theory claims that the key of knowledge innovation is a benign interaction among government, industry and university in a society of knowledge economy. Inter-organizational cooperation is the main feature of knowledge innovation based on scientific researches, and the interaction between government and industry becomes the core power in the innovation system. The development of knowledge economy has helped the region to form a three helix innovation space composed of firms, universities and governmental departments from a union of geography, politics and culture. The driving force of regional innovation lies in a virtuous cycle of ecological system, which supports innovation and benefits the whole region, so the region should take the knowledge as its innovation strategy, reflecting relative importance of regional innovation cluster in the local political and economic development.

Researches show that provincial innovation environment is positively related to university knowledge innovation <sup>[14]</sup>. Although having some certain research foundations, our local universities cannot operate and control the social problem-solving resources due to low organization openness. Therefore, diversified cooperation relationship should be established with external organizations. Meanwhile, innovation region based on knowledge should complement each other with the development of local universities. Henry Etzkowitz believes that regional innovation three spirals is formed through a series of cooperation and interaction among the government organizations, industrial entities and university institutions in the regional space, but its interactions are the form of innovation activities including knowledge space,

collaborative space and innovation space. Local universities should take locally actual problems into its research consideration, eyeing region development to create a new knowledge space. Specifically speaking, policies that aim to boost research need to integrate development of regional economy and society development policies. Creating a consensus space is to create a neutral place by summoning all the knowledge innovation activists, with different backgrounds and ideas, where people from universities, government and enterprises are called together to discuss innovation. By creating innovative projects, action plan or strategy of regional development, knowledge innovation is improved and accordingly actions are rapidly carried out. To create a consensus space is a vital stage and indispensable means to promote university knowledge innovation and regional development, whose mission is to create and achieve the relevant organization mechanism that knowledge innovation needs, but factors that influence university knowledge innovation in different regions may be varied.

Some areas are affected with venture capital organization; others focus on the science garden or something else. A more suitable approach is to study the advantage and weakness of the area, objectively analyze local strength and innovation condition and design local-fit knowledge innovation strategy.

The regional government should play an important coordinating role in regional innovation networks to create an interaction mechanism for knowledge innovators, regional venture investors and market operators <sup>[15]</sup>. Of course, local government should support local innovative university, providing external institutional guarantees for university knowledge innovation. As the organization to create knowledge, local university can take multiple approaches, including technology transferring, conferring patent or licensing intellectual property, etc. taking full advantage of government resources from local and central to own the leading position in the regional development strategy. The ability of cooperation knowledge innovation will be enhanced if the local university has become the regional research center, forming knowledge innovation network with the regional government and industry.

#### *4.2 Insist on Problem-oriented Knowledge Innovation Logic*

Entrepreneurial university in American model enjoys absolute advantage in the academic market whose knowledge innovation generally experiences three stages, that is, knowledge production, knowledge transformation and knowledge application. Logics of university organization are “co-proceeding of academic accumulation and academic entrepreneurship” <sup>[16]</sup> (P157). While entrepreneurial university in European model has no absolute advantage in the academic market, whose knowledge innovation based on problem-solving, with clear market orientation. In China, disorder competition and strict rank difference heavily constraint the development of local universities, so they need to find their own resources and change competition mode. Insisting on problem-oriented innovation pattern is a knowledge innovation new strategy of local university.

The oriented-problem is the power source of knowledge innovation. Henry Etzkowitz believes that the research subject choices for entrepreneurial university in mature stage are from the university and the internal disciplines as well as their external environment, while the most perfect option is from the interaction between university researchers and outside resources such as the cooperation projects. The research university still focuses on solving subject problems and its derivative corporations come into being as the result of fierce competition for research workers to gain research fund, so university has become a sealer for intelligence property and venture capitalist for derivative products. For local university, although interaction among scientific researches, economy and social activities, more and more researchers begin paying attention to practical problems that need to be solved. The boundary of knowledge should be determined by practically practical application, which is in turn decided by target

clients and users. For university that has research foundation to a certain extent, it is not appropriate to blindly pursue homogenization model of university development. More importantly, it should have a clear value judgment and awareness to serve regional society, insisting on solving regional social problems. Driven by the aims to serve regional society, local university should see how to address social practical issues as key foundation of knowledge innovation. Over-disciplinary research center need to be established by local university, coordinated with local government and enterprise to head ahead interactions between traditional colleges teachers, finding out the ways to solve practical problems, and knowledge can be created in the problem-solving process.

#### *4.3 Build Double-centered Entrepreneurial University*

“Knowledge itself is the purpose.” Traditional universities usually center on knowledge, exploring advanced knowledge, so it becomes traditional university’s universal choice to pay attention to knowledge innovation that based on different subjects. American entrepreneurial universities transform original university-knowledge- innovation achievements, commercializing research results, which are then called academic capitalization. This is a driving force for science creation<sup>[16]</sup> (P222. Slauter Sheila and Larry Leslie called it academic capitalism that colleges as well as teachers ensure external capital markets or activities with market characteristics<sup>[17]</sup> (P8). Academic capitalization is a market-oriented knowledge creation and transformation methods, representing a change from curiosity-driven research to the market-oriented application research. Undoubtedly, this idea is contradictory with Humboldt’ opinion. Slauter believes our future university should come up with new organizational structure and stimuli approach and create new knowledge propagation paths, organizational boundaries and cooperation network to deal with academic capitalism test. Burton Clark said:” facing with academic capitalism, we need to establish entrepreneurial universities that base on academy not only to inherit Humboldt ideal but to adapt to the real changes by organizational innovation”. In summary, we believe that for local universities, it is very important in response to the tests of academic capitalism under the background of the knowledge economy society to organizationally transform them to be entrepreneurial university with double focuses: academy and career-undertaking.

Academic entrepreneurship is the fourth major functions of the development and evolution of the modern university, which includes two components: academy orientation and entrepreneurship orientation. Local universities should take the strategy of two orientations. Knowledge capitalization is the essence of entrepreneurial university, while academic ability and academic capital accumulation are its premises. In reality, not all local universities stay a low academic level, but most of them still adhere to the traditional discipline orientation with certain academy ability and academy capital. Teaching and researching are both very important for local university where an academic community, known as the “academic tribe”, committed to a certain field. However, with the proliferation of new knowledge creation approaches, the boundaries between disciplines are displaced by opener organizational structures where different knowledge and competition are combined in a new way<sup>[18]</sup> (P134). Knowledge innovation is a team work, an endeavor of the whole university members at all levels. Therefore, local universities should attach importance to regional government’s decision-making and market mechanism towards universities to establish an interdisciplinary academic organization, which ultimately promotes the innovation of university academic knowledge. This is the university organization transformation that centered on the academy.

Post-modern society is a society that incessantly gives birth to, transmit and apply knowledge, so

knowledge innovation is no longer confined to intellectual activities, and it extends to production and application process. Reforming operation mechanism and enhancing the university management ability can vivify universities' organization and timely response to changes of the environment, which is university organization transformation centered on entrepreneurship. Knowledge innovation of local university needs to break the boundary between university and the outside world, tackling non-discipline problems by making full use of traditional disciplinary advantage. On the one hand, local universities should create an internal culture of academy and entrepreneurial-advocating and insist on a combination of university spirit and pioneering spirit. Opportunity should be seized from the university to respective colleges to apply entrepreneurship into its routine work and help all students train their entrepreneurial abilities. Three parts: teaching, research and career-undertaking need to support each other to form a complete network. On the other hand, local universities should emphasize technology transfer's importance in university knowledge innovation, and establish a close relation with local government and industry to make the university researches attach to regional practical problems from their beginning which promote the "bottom-up" knowledge innovation. Based on the requirements of regional development, local university should put forward an explicit development planning before formally designation, discussing the potential investors. At the same time, it is suggested to establish a technology transfer mechanism and the incubator facilities, improve technology-transfer ability to transform and apply the achievements of local university knowledge.

## **5. Conclusion**

In the knowledge economy society, although cooperation among organizations or institutions gains its popularity increasingly, entailing a participation of university, government and industry, corresponding innovation should be followed in the internal organization of the university. It is a correct path of local university to form the knowledge-based entrepreneurial area and adhere to the problem-oriented strategy and establish double-centered entrepreneurial university of academic and entrepreneur. However, local universities are still at a relatively low position in the academic system, whose academic resources and ability to affiliate industrial economy are different, so its strategy to transform university organization and innovation spirit will be reflected in a distinctive way. As a result, the interaction among the subjects of knowledge innovation could not go far without the government' help especially the local government's supports. To promote the transformation of local university to entrepreneurial university and create more knowledge during the transformation process of knowledge innovation organization, coordination roles of local universities in regional innovation network should be given more priority

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