

# 主論文の要約

(Abstract of Dissertation)

論文題目 : **What Accounts for Achievement of University-Industry Research Collaboration? Evidence from China and Japan**

(産学研究連携の実現の説明要因は何か？中国と日本の事例)

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論文内容の要約 :

To achieve knowledge application through university-industry (UI) collaboration has been widely considered as one of the most salient ways for accelerating innovation and economic growth. As a result, growing attention from both academia and policy makers has been devoted to this issue, trying to explore it from both theoretical and practical perspectives.

A number of gaps are found in the literature. This research aims to fill three of such gaps. First, existing research lacks discussion on the interactive-natured UI linkages such as collaborative R&D, contract research and consulting. Increasing authors have noted a less significant role of direct mechanism of commercializing Intellectual Property (IP) to the interactive-natured UI relationships in promoting innovation (Cohen et al. 2002; Mowery and Sampat 2006; Agrawal and Henderson 2002; Scharinger et al. 2002). Second, the literature lacks systematic understanding on factors influencing UI collaboration. Third, most arguments in the existing literature were drawn from the western contexts as taken-for-granted institutional settings, thus failing to provide insights into how specific institutional structures within varied innovation systems shape the way UI collaboration is conducted (Perkmann and Walsh 2007; Owen-Smith 2005). The institutional environment and social economic conditions in the Asian context such as China and Japan are quite different from its western counterparts and the variances will potentially provide more insights into important factors associated with UI collaborations.

This research aims at examining important factors and dynamics of factors leading to achievement of UI collaborations based on case studies of UI collaborative projects in the contexts of China and Japan by answering the main research question as “What accounts for the achievement of UI collaboration in the context of China and Japan?” In order to address the main research question, this study also proposes three sub-research questions: (1) under what conditions can achievement of UI collaboration be realized in the context of China and how? (2) under what conditions can achievement of UI collaboration be realized in the context of Japan and how?, and (3) how the conditions were different between the two country contexts and what caused the differences?

In this study, achievement of UI collaborations refers to the commercialization of university research by both parties. Based on literature review, it examines important factors influencing achievement of UI collaborations, integrating analysis on macro level of institutional frameworks, organizational level of the university/firm, and individual level of academics. In order to answer the research questions, this study adopts the qualitative method of case study based on multiple successful cases of UI collaborative projects in the two Asian countries. Three UI collaborative case projects which have gained considerable prominence in commercializing university research were selected

respectively from Shanghai Jiao Tong University of China and Nagoya University of Japan. The projects were all conducted jointly by university researchers from the engineering schools of each university and their industrial partners. The data was collected chiefly during 2011 March to 2014 April through semi-structured in-depth interviews and supplemented with document reviews. In total, 68 interviews were done to 64 informants from universities, firms and government agencies. Through the case studies in light of respective country context, this research draws key findings as follows.

This study provides theoretical insights in terms of the dynamic conditions through which factors pose impact on UI collaboration. With regard to the role of the government, the two countries strongly imply a similarity in terms of the framework formulation at the macro level towards developing a formal technology transfer infrastructure centered on knowledge dissemination and application between the academic and industrial spheres. Both countries have endeavored to strategically positioning and promoting university-generated knowledge dissemination and application in the national agenda of development. Nevertheless, this research identifies that, although the role of public support of two countries share similarities in assuring research progress, reducing industrial R&D cost, rationalizing organizational support and strengthening industrial R&D investment, significant differences exist between different countries in the exact aspect on which public support poses impact. However, the focus of public support should be contextualized according to the specific institutional, social and industrial conditions within which UI collaboration takes place.

In China, the government was important to UI collaboration through public subsidies and other supplementary public support. Firms lack sufficient funding and skill capacity which hinder them to invest in commercializing university research. Such supplemental public support in China is significantly important to affect firm's strategies in R&D investment and UI collaboration. In the case that public subsidy is absent in UI collaboration, individual academic's active approach in pursuing collaboration with firms becomes extremely important.

In Japan, on the other hand, the government's role was more crucial as intermediaries via the coordinator system in bridging the academic and private spheres. Considering the historical independent relationship between the academia and the industry in Japan, the impact of such intermediating role played by coordinators was deemed to have particular importance. Nevertheless, public subsidy was found from the Japanese projects not as an indispensable factor in conducting UI collaboration, which fits with fact that in the industrial R&D investment in Japan, the ratio of public funding has been trivial.

In terms of the university-related factors, at the organizational level of universities, both universities have institutionalized organizational support by establishing units such as TTOs and adopted an encouraging attitude towards UI collaboration since 1990s. However, when the university's encouragement and support towards UI collaboration was absent, the public coordinators' involvement can take over the role to accelerate the matching process of linking the academic and industrial spheres and also the collaboration process that followed up as in the Japanese case projects. While such coordinator system does not exist in China, this part of intermediating responsibilities can be undertaken by university-level organizations such as the AITRI or NTTC of SJTU in China's case. Nevertheless, it is worth noting that, since performance in terms of industrial linkages and commercialization has not been directly linked to the evaluation of academics in both cases, the pragmatic impact of these adaptations made by universities to promote UI linkages and exploitation of university-generated knowledge might not be so straightforward.

However, at the individual level of university researchers, university researchers in Chinese universities approach the private sector more proactively and were involved in the collaboration process more deeply than their counterparts in Japan. Historically speaking, universities and the industry has been keeping a closer relationship in China and universities in China cover a broad spectrum of activities, ranging from education, research to commercializing research by establishing

university-run enterprises or attracting social resources for commercialization (Zhou 2005). Such historical role of universities has made it easier for their researchers to approach the industry. Another reason explaining the aggressiveness of Chinese university researchers approaching the industry sector was largely due to their urgent need to seek for additional funding other than public grants, and also because of the vicinity of nature of university research to the industrial needs in applied research and engineering. All these factors led to an active role of university researchers in seeking for UI collaboration. Moreover, as shown in the Chinese projects, because of the insufficient research capacity of partner firms, the intellectual support of university researchers in China are required to have a deeper involvement in UI collaboration, covering stages of innovation from theories, technologies, engineering issues to equipment technologies, particularly in the down-stream phases of product development. In contrast, the high level of research capacity in Japanese firms called for a different role of university researchers in the UI collaboration process.

For the role of firms, the varied level of research capacity of partner firms determined their different roles in promoting the UI collaboration in the two countries, particularly in the process of applied research and engineering where firms are supposed to play the central role. The weaker research capacity of Chinese partner firms has caused its weak role in UI collaborations. In addition, the weak research capacity demanded for a more involved manner of participation and a stronger role of university researchers in UI collaborations. On the other hand, in Japan, the public funding was helpful for forming UI collaborations but not considered as indispensable by partner firms.

To synthesize, as a large proportion of the literature has devoted to quantitative studies on the impact of institutional and organizational factors on responses of academics towards UI collaboration and little is known at the micro level of how varied levels of factors take effect and interact at the micro level, thus this research aims at providing insights in terms of the dynamics of factors influencing UI collaboration at the micro level. First, while the case studies showed that public support was critical, the focus of public support should be contextualized according to the specific contexts within which UI collaboration takes place. When lack of industrial research funding and human resources are major factors hindering industrial innovation, public support should be more efficient through provision of public subsidies, preferential policies for industrial investment and promoting the proactive role of university researchers in application of research outcomes. When there is a striking disconnection between universities and industry, then coordination in linking the two spheres is more necessary. Second, this research implied that factors affecting UI collaboration achievement can be complementary in nature with one another. For example, the case studies suggested that the role of university support and public support is complementary in that, when university support is absent or academics are not proactive in participating in UI collaboration, the government should take over the role such as the coordinator system in the Japanese projects to promote UI collaboration. While in the case of Chinese projects, there is no coordinator system, then a wider variety role of university is demanded. In addition, the demand for input from universities and participating academics, and for research capacity of partner firms can be complementary. Differed forms of participation in UI collaborations on the part of individual academics and universities are demanded to fit for varied extents of socio-economic development, partners with varied industrial absorptive capacity and different framework for university research. From the case studies of China and Japan, it could be asserted that varied systems of knowledge production and research application would probably call for the existence of idiosyncrasies in terms of ways of involvement of innovation actors at the micro level of UI collaborations across different countries.

In all, examining the case projects in light of the respective institutional and socio-economic conditions, it could be asserted that varied systems of knowledge production and research application strongly call for differed ways of involvement of innovation actors when it comes to the micro level of UI collaborations, thus demanding a scrutinized analysis on the dynamics of factors which are

considered as important to UI collaboration.