University and Industrial Sector Collaboration of Knowledge Transfer: A Review and Synthesis of the Literature

Yanyong Kodcharat
tortoon@hotmail.com
Akom Chaikeaw
akom.co@psu.ac.th
Prince of Songkla University

Abstract

The purposes of this article were to review related literature in order to develop a conceptual model of factors affecting collaboration between universities and the industrial sector of knowledge transfer in Thailand using resource dependence theory. In this theory, it is believed that resources are of crucial importance for the existence and development of the organization. The results of the study revealed that there were six factors: project management, organizational culture, communication, motivation, social networks, and knowledge management. From the results of literature reviews, a hypothesis of a model could be set that project management, motivation, social networks, and knowledge management had direct effects on cooperation between university and industrial sector collaboration of knowledge transfer while factors that had both direct and indirect effects were: organizational culture and communication. The developed model should be tested against empirical data for its validity and model invariance in order for universities and the industrial sector to use the model that had been tested in setting suitable strategies for further collaboration of knowledge transfer.

บทคัดย่อ

บทความนี้มีวัตถุประสงค์เพื่อทบทวนวรรณกรรมที่เกี่ยวข้องสำหรับการพัฒนาแบบจำลองแนวคิด (Conceptual model) ขององค์ประกอบที่มีอิทธิพลต่อความร่วมมือระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมเพื่อดำเนินการถ่ายทอดความรู้ในประเทศไทย โดยทฤษฎีการพึ่งพาทรัพยากร (Resource dependence theory) เชื่อว่าทรัพยากรมีความสำคัญอย่างยิ่งต่อการดำเนินงานและการพัฒนาองค์กร และผลการศึกษาพบว่ามีองค์ประกอบจำนวน 6 องค์ประกอบ คือ การบริหารโครงการ วัฒนธรรมองค์กร การติดต่อสื่อสาร แรงจูงใจ เครือข่ายสังคมและการจัดการความรู้ จากการทบทวนวรรณกรรมสามารถกำหนดสมมติฐานของแบบจำลองได้ว่า การบริหารโครงการแรงจูงใจ เครือข่ายสังคมและการจัดการความรู้ มีอิทธิพลทางตรงต่อความร่วมมือระหว่างมหาวิทยาลัยและภาคอุตสาหกรรมเพื่อดำเนินการถ่ายทอดความรู้ ขณะที่องค์ประกอบเชิงระบบส่งผลทางตรงและทางอ้อมคือ วัฒนธรรมองค์กรและการติดต่อสื่อสาร โดยแบบจำลองที่พัฒนาขึ้นนี้แล้วควรนำไปทดสอบความสอดคล้องกับข้อมูลจริงประจักษ์ และทดสอบความไม่แปรเปลี่ยนของแบบจำลอง เพื่อให้มหาวิทยาลัยและภาคอุตสาหกรรมน่าจะจัดทำเป็นขั้นตอนสำคัญเพื่อใช้ประกอบการกำหนดกลยุทธ์ในความร่วมมือดำเนินงานระหว่างกันอย่างเหมาะสมต่อไป

Introduction

Universities play an important role in technology development and knowledge under the economic development process for developing and developed countries (Sugandhavanija, Sukchai, Ketjoy, & Klongboonjit, 2011). In addition, the economic structure of Thailand is in its changing period from an agriculture-based economy to an economy where the industrial sector is increasingly more important. The gross domestic product (GDP) during 1960-1990 showed that the Thai agricultural sector tended to slow down while the industrial sector was growing (UNESCO, 2009) with cooperation between
universities and the industrial sector that has become more important in the industrial world since 1970. Most related literatures attach importance to mechanicals to enhance relationships and benefits resulting from cooperation between universities and the industrial sector. Moreover, the results of some research confirm that basic research conducted by universities have concretely benefited business operators and indirectly benefited learning and teaching contributing to graduates' skills, universities' modern methods and equipment, and social networks as well as more competencies in science and technology (Salter & Martin, 2001).

Complementation is a result of cooperation and is a key reason for close relationships between universities and the industrial sector. There are many reasons for close cooperation. For example, universities want to send their students to be trained and to learn from actual problems arising from real work situations, to create employment opportunities for their graduates, and to have access to business places where knowledge and technology are used. For the industrial sector, it needs to have access to competent graduates, specialists and product-testing laboratories, etc. (National Science Board, 1996).

 Universities and the industrial sector are different in their organizational culture. Universities focus on producing knowledge, teaching and learning while the industrial or business sector focuses on benefits and competitiveness. However, communication between each other can help them to have the same understanding in working together and can result in social networks that help their operations to be more efficient and more effective.

 Studies on factors affecting collaborations between universities and the industrial sector are important and in this article, the researchers, therefore, investigated factors that affected collaborations between universities and the industrial sector in Thailand, especially in terms of knowledge transfer.

Related concepts and theories

This study employed the resource dependence theory as the conceptual framework in order to understand collaboration concepts between universities and the industrial sector, and factors that affected the collaborations.

Resource dependence theory

The resource dependence theory believes that resources are crucially important to the existence and development of the organization (Pfeffer & Salancik, 1978). Therefore, the organization exchanges its resources with other organizations. The exchanges can be in terms of monetary, physical resources, information, or other social legitimacies that are concretely practiced from outside the organization. On the contrary, the organization cannot survive if it does not respond to the environmental needs. There are different viewpoints on the organizational environment and the ways the environment affects organizational behavior and structure. Firstly, the environment in the form of other organizations can directly affect the exchange relationship (Pfeffer & Salancik, 1978). For this viewpoint, the management structure is to give confidence in resource management in that it increases dependence on resources from exchange relationships. This makes the management different and requires the organization to establish an office to directly operate it (Tollbert, 1985). Secondly, it is the environment in the form of understanding and expectations of the organization and behavior of social members (Zucker, 1983).

Public organizations and private organizations are different in terms of the sources of their financial aid. Public organizations receive most of their incomes from the government according to law while private organizations receive theirs from selling their products or services and being given by other private organizations. Receiving suitable help in terms of money, physical and human resource development from outside resources is very important to organizations.
Definitions of university and industrial sector collaboration of knowledge transfer

Collaboration between universities and the industrial sector is part of a movement relationship between science and technology that results in academics, industrialists, researchers, and policy planners who operate to obtain results economically, socially, and culturally. In its first stage, the concept of collaboration between universities and the industrial sectors was on building a system of donating land to universities by the private sector, and then it became more official when collaboration in an agricultural experiment began in 1887.

Collaboration between universities and the industrial sector has become more prominent during the last 30 years. In 1980, a policy was formed and a social contract was made between science and social disciplines in America (Lee, 2000). It was a way of returning benefit to society after academics had received support from society. In 1980, there was competition crisis and structural change concerning intellectual property that was linked with incentives. As a result, collaboration between universities and the industrial sector was promoted (Lee, 1997) and governments of many countries started doing the same thing. More than thirty years have passed and it can be said that such collaboration has been very beneficial and will continue into to develop the policy structure that makes collaboration necessary as well as organizational interest and differences in organizational cultures. Regarding sustainability of the collaboration, related research results state that there must be true understanding of sustainable collaboration with the knowledge base of each sector of the collaboration.

Collaboration between universities and industrial sector as defined by Faulkner and Senker (1994) is a form of reaction such as collaborative research, contract research and consultation. In the industrial sector’s point of view, it is more important and more valuable than intellectual transfer such as licensing. The industrial research institute of the United States of America (1995) defined universities and industrial sector collaboration as a concept of complementarities and gave an example of a university as having an intellectual resource, research infrastructure while the industrial sector as having practical expertise, financial resources, internship opportunities for students and employment opportunities for graduates. Carayannis, Alexander, and Loannidis (2000) state that the collaboration is a focus on knowledge, such as knowledge sharing, exchanging and integrating in order to reduce obstacles to organizational operations.

Thus, for this study, it can be concluded that collaboration between universities and the industrial sector for knowledge transfer refers to determination in doing activities together with direct participation of universities and the industrial sector in a knowledge exchange system; it is collaboration in knowledge transfer to improve work efficiency to obtain good new things, access knowledge and technology in depth.

Factors affecting collaboration between universities and the industrial sector for knowledge transfer

In reviewing related literatures, it was found that there are many factors that affect collaboration between universities and the industrial sector in knowledge transfer. The authors have researched 147 articles related to knowledge transfer collaboration between university and industrial sector to analyses the frequencies of factor promoting the collaboration, it was found that the highest frequent factors is motivation (41), social networks (36), organizational culture (28), communication (24), project management (18), knowledge management (13). Others factors found in small frequencies are trust, funding, size, geographical location; evaluate potential partner, technological capabilities, absorptive capacity, information and communication technologies (IC Ts), etc. and considered the correlation of the variable in each articles. However, only six factors were chosen for this study. The details of each are as follows:
**Project management**

Factors related to project management that affect projects that make them unsuccessful were found in related research. Project management, according to the British Standard 6079, refers to planning, organizing, monitoring, and controlling so as to achieve the objectives in the set timeframe, costs, and efficiency.

Barnes, Pashby, and Gibbons (2002) concluded that the main components of collaboration between universities and the industrial sector are: 1) evaluating the collaborative counterpart; 2) quality project management; 3) factors of trust, determination, and continuation are important for collaboration; 4) flexible management process; and 5) good relationship between universities and the industrial sector requires a balance of organizational achievement.

The results of experience survey of project managers conducted by White and Fortune (2002) revealed that there were four factors that were important to success of project management: clear project objectives, sufficient fund and resources, feasible work schedule, and support from high-level administrators. This is in congruence with the findings of a study done by Hauschildt, Keim, and Medcof (2000) who states that the project manager has a role that is useful to the efficiency in project management and support from people involved is needed.

**Organizational culture**

Collaboration between universities and the industrial sector is very challenging because universities build new knowledge and educate students while the industrial sector concentrates on applying valuable knowledge to build competitive advantage (Dasgupta & David, 1994), especially doing joint research with universities, in which not only the industrial sector that has to learn to work with organization with different cultures but both parties have to be able to work together under different incentive systems.

Studies related to collaboration between universities and the industrial sector found that culture has relationships with differences in perspectives, priorities and values of collaborative partners (Champness, 2000) which correspond to Barnes et al (2002) findings that universities and the industrial sector were different in their perspectives and priorities. While universities focus on academic work such as research publications, the industrial sector wants to make use of the research findings for the benefit of its business.

Plewa (2009) explored organizational culture differences in the context of university and industrial sector relationships and found three factors that influenced organizational culture. First is difference in working time and flexibility that can affect work commitment. Second is difference in marketing that can affect the organization’ intention to operate continuously. Third is difference in trust and commitment that can affect collaboration success.

**Communication**

Effective relationship management is a result of good communication. The better quality of communication and information sharing is related to collaboration success as communication is one important characteristics of a successful organization. The work inside the organization and between organizations needs a communication process (Mohr & Spekman, 1994). In addition, communication improvement consisting of frequency, accuracy, and willingness in data sharing is a second important characteristic that is important for collaboration success (Tuten & Urban, 2001).

Kelly, Schaan, and Joncas (2002) conducted a study on four major factors that were problems for first year collaboration and found that communication accounted for 25 percent of the problems. The problems consisted of establishing communication, maintaining communication, misunderstandings between the partners, physical distance, and personality conflicts between people, language differences, and structural differences.

**Motivation**

There are many reasons for university and industrial sector collaboration (Santoro, 2000). The reasons for universities are, for example, getting research funding, needs for testing knowledge and theories in real work situations,
needs for seeking business opportunities, getting more knowledge from the real working world to use in the learning and teaching situation, etc. The reasons for the industrial sector found in related literatures are, for example, needs for solutions to technical problems in the work situation, process development and new products, product quality development, access to new research, and needs for relationships in networks with universities, etc. (Lee, 2000). Lee (2000) studied sustainable research collaboration between universities and the industrial sector from empirical evaluation and found that university staff members that collaborate with the industrial sector have personal purposes in terms of time, energy and intellectual resources in the same way as the industrial sector having its own reasons for work collaboration.

Lai and Tsai (2009) specify that regulations, organizations, education, and incentives are important factors of university and industrial sector collaboration and also indicate that incentives and ability of knowledge transferors have positive influence on willingness in participation in knowledge transfer.

Social networks

Social networks play an important role as a way that leads to access to necessary resources and data for organizational development (Johannisson, 2000). Social networks are relationships among groups of people or organizations with the same interest and can be used in learning amongst themselves (Gregory, 2007) as they are significant knowledge resources that help organizations to work more efficiently from their relationships.

Aralchvilli and Cardozo (2000) found that from seven out of eight studies, access to social networks was the first factor that made the organization successful. This corresponds with the study by Lea, Yu, Maguluru, and Nichols (2006) that found social networks lead to business success from sharing skills and fund among themselves. Moreover, it was found that social networks provided organizational members with opportunities to search for support from society and can create innovations from doing business together.

Relationships among organizations expand knowledge which consists of information and data that link with financial condition of organizations, competitors, industry tendencies, and technological growth (Darroch, 2003) and participation in social networks can result in deeper knowledge than conducting studies themselves (Numprasertchal & Igel, 2005).

Knowledge management

Jasimuddin, Klein, and Connell (2005) explain that knowledge management including both tacit and explicit knowledge plays an important role in collaborative technology programs. Santoro and Bierly (2006) extend this idea to university-industry collaboration to acquire tacit and explicit knowledge.

Competitive advantage is crucially associated with the ability of firms to apply knowledge to their innovation process. This statement leads us to consider the benefits of transfer of knowledge. Leonard-Barton (1995) and Nonaka and Takeuchi (1995) point out that transfer and use of knowledge from external sources expands a firm’s knowledge base. Grant and Baden-fuller (2004) and Rosenkopf and Nerkar (2001) assert similarly that knowledge transfer can promote the creation of new products and technology. Moreover Spender and Grant (1996) believe that knowledge transfer can affect the firm’s capability to increase economic rents. Consequently a firm’s success may significantly derive from knowledge from external sources and development of innovative outcomes resulting from appropriating the knowledge.

Later Sampson (2007) describes the need for firms to created new knowledge and corresponding capabilities as required by the market. He also describes challenges in research and development collaborations in association with the need to create knowledge transfer across organizational boundaries.

Regarding the acquisition of tacit and explicit knowledge between university-industry alliances, Sherwood and Covin (2008) report that the transfer of tacit knowledge can be influenced by the trust built up by the partners. Therefore industrial sectors and entrepreneurs should find
excellent opportunities to work with university researchers in order to transfer knowledge from the university to the firms.

From the above literature review, it can be concluded that relationships between factors that can be developed into an organizational conceptual framework that has influence on collaboration between universities and the industrial sector in order to transfer knowledge as shown in Figure 1:

![Diagram of conceptual framework](image)

**Figure 1:** Conceptual framework from documentary research

A model was developed to measure influence of variables or factors that have direct and indirect effects on university and industrial sector collaboration of knowledge transfer. The model consisted of three exogenous variables: organizational culture, communication and knowledge management and four endogenous variables: project management, motivations, social networks and university and industrial sector collaboration for knowledge transfer.

**Conclusion and recommendations**

In the development of the conceptual model of factors that have influence on university and industrial sector collaboration of knowledge transfer, a related literature review was conducted and found that factors that have direct influence on university and industrial sector collaboration of knowledge transfer were project management, motivation, social networks and knowledge management. The factors that have both direct and indirect influence were: organizational culture and communication. It is recommended that the model that has been developed should be tested against empirical data using the structural equation model (SEM), and the data should be analyzed with path coefficient to order to test the significance of the path coefficient of the components or factors that have influence on university and industrial sector collaboration of knowledge transfer. Multiple group analysis should also be conducted to test the model invariance, respectively, so that universities and the industrial sector can apply the results in making suitable strategies for their collaboration.
References


