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Global Knowledge Transfer Framework: A University-Industry Collaboration Perspective

Srigowtham Arunagiri*

Indian Institute of Science, C V Raman Ave, Devasandra Layout, Bengaluru, Karnataka 560012, INDIA
E-mail: a.srigowtham@gmail.com

Nawarerk Chalarak, Naoshi Uchihira, Yasuo Sasaki

Japan Advanced Institute of Science and Technology, Asahidai, 1 Chome−1, Nomi, Ishikawa, 923-1292, JAPAN
E-mail: nawarerkc@jaist.ac.jp, uchihira@jaist.ac.jp, sasaki@jaist.ac.jp

Mary Mathew

TECHLINK, 2000 Argentia Rd, Plaza 1 Suite 301, Mississauga L5N 1P7, CANADA
E-mail: marymathew24@gmail.com

* Corresponding author

Abstract

Today's business environment is characterized by huge competing technologies, shorter product life with advent of new technologies in an ever-increasing pace. Current business paradigm has forced industries to seek help of universities, who are considered a powerhouse of innovations and intellectual minds. This collaboration environment poses more complex problems for effectively transferring knowledge. Although bridge system engineers who work as knowledge transfer facilitators between collaborating industries are quite common, such facilitators' role in a university-industry collaboration setup has been less discussed. Our study aims at understanding specific roles of such facilitators called the "Bridge Managers (BM)", in facilitating smooth knowledge transfer and to understand possible places for improvement. In the current business scenario, where collaborations span across regional boundaries, roles of such BM become increasingly difficult and complex. Our study tries to understand these problems related to university-industry collaborations in a multicultural setup.

Keywords: university-industry collaboration, bridge system engineers, R&D bridge managers, knowledge transfer, global R&D collaborations.

Introduction

Knowledge management in an inter-institutional collaborative setup has always been considered a tricky task, especially when the collaborations span across regional boundaries. Much of these difficulties may be attributed to difficulties in transfer of information and knowledge across these institutional barriers. Bridge System Engineers (BSE) were found to be employed by companies to help them overcome these knowledge transfer (KT) barriers by effectively communicating

between culturally diverse collaborators and drive projects to successful completion. In current business scenario, in-house R&D is seldom preferred a choice to maintain competitive advantage and hence universities are increasingly sought out as collaborative partners. Universities, a rich powerhouse of innovative minds and their expertise in basic R&D research, are considered essential for sustaining business, especially when industry believes using universities' technologies could help them save time to produce a novel product, rather than starting from scratch involving in basic research activities. However, these kinds of collaborations between universities and industries have been observed to be a source of problem in terms of successfully transferring knowledge from one entity to another.

In case of a university-industry (U-I) collaboration, where the collaboration would be aimed at R&D rather than a conventional business project as in industry-industry (I-I) collaboration, specialized managers called Bridge Managers (BM) would be required to coordinate such collaborative R&D projects. The literature has discussed about roles of BSE and traits in multicultural industrial collaboration setups. Literatures discussing roles of BM in a U-I setup were found to be scarce. Universities having priorities and cultures different from industries pose a formidable barrier for knowledge transfer. Therefore, understanding BM's specific roles in this setup becomes crucial for industries to maximize their returns from university collaborations. Industries can seek out to employ those BM with specific skill sets who could cope with knowledge transfer barriers specific to U-I collaborations, especially when these collaborations are from different geographical locations differing in culture and language. Understanding barriers to knowledge transfer and roles of BM in these contexts is the focus of our current study.

Literature Review and Research Questions

Our study focused on literatures discussing perceived barriers for knowledge transfer between collaborating entities and qualities considered essential for a bridge system engineer to mitigate these barriers to enable successful transfer of knowledge between the collaborators.

Barriers to knowledge transfer

In U-I setup for R&D, industries perceive that universities' licensing policies have a huge impact on knowledge transfer. Universities' priorities and values like teaching and dissipating free knowledge for public could conflict with industries' priorities, which is more towards commercialization. Industries also believe that university research results are not readily available for commercialization and continuous support from university becomes crucial for product development (Flores et al., 2009). Geographical distance and absorptive capacity of recipient firm, who receives technology from universities affect transfer of tacit knowledge (Flores et al., 2009). They also add that geographical distance is criteria affecting collaboration and hence for tacit knowledge transfers, extensive communication in form of face-to-face meeting, conferences, email, phone calls, video calls are necessary (Flores et al., 2009).

Lack of motivations to professors, attitude of more-take-than-give attitude and fear of losing IP to academic publications are obstacles for knowledge transfer. Innovative culture, innovation strategy, absorptive capacity of recipient firms, proximities of partner entities, public funds

availability are important for knowledge transfer from universities to industries (Szulanski, 1996, Flores et al., 2009). Some researchers believe that lack of motivations to professors (Szulanski, 1996), more-take-than-give attitude and fear of losing IP to academic publications are major obstacles for knowledge transfer.

In some cultures, prior acquaintance and Chinese guanxi, which denotes necessity of a level of trust among acquainted people for better KT, are considered to be important for collaboration (Hemmert, 2015). Communication gaps, non-adherence to "ho-ren-so" manner on vendor side teams, lack of domains, legal and policy knowledge also form a formidable barrier for KT between collaborating entities (Huong et al., 2014).

Uncertainty avoidance, the way of handling problems and fear of competitors in collaboration in case of more experienced members, can be different in culture causing problems in knowledge sharing. Tacit and explicit knowledge sharing is essential, geographical proximity, cultural differences acknowledgment all contribute to improving knowledge flows (Almstedt, 2008).

Uchihira et al. (2012) analyzed knowledge transfer in the R&D project management, and pointed out the perception gaps between university side and industry side. For example, the university side can recognize technology and market in the same way of the industry side, but cannot understand the corporate strategy and organizational difficulties of the company. This research mentioned gaps in intra-national R&D collaboration, not global R&D collaboration.

Competence of bridge system engineers

The literature discusses that BSE is crucial for software outsourcing in Vietnam (Huong et al., 2014). They have tried to define roles of BSE and distinguished their working stages as (1) planning with both parties, (2) breaking down requirements bringing clarity through mind maps animations, produce supplementary documents for both parties, (3) removing bugs, quality checking and problem solving, (4) Documenting experience and sharing (Huong et al., 2014). Some authors have identified specific competences of BSE (Nicholson et al., 2014, Nishinaka et al., 2015) and discussed that understanding both cultures (societal, organizational & individual), good communication skill, good negotiation skill, expatriate, good domain knowledge on both sides, knowledge on local economics & infrastructure and ability to maintain flat organization structure are crucial traits expected out of a better BSE.

Research questions

Considering issues surrounding knowledge transfer in multicultural collaborative setup and also university-industry collaboration setup, the major research questions of this study would be aimed at understanding differences in the role of BSE and BM, where priorities attached to I-I and U-I considerably differ. Moreover, this study focuses and tries to identify difficulties salient to cross cultural U-I R&D collaborations, from BM perspectives. The presence of people from a variety of cultural backgrounds although contribute to efficient KT, they can be considered an important stimulator of open innovation. Hence our study tries to understand how cultural gaps in multinational collaboration setup would be viewed from a knowledge creation perspective.

Our study also tries to understand these KT barriers from a context of collaboration between developed and developing countries like that of Japanese companies collaborating with Indian universities and also understand possible suggestion from BM's perspective, that can better such collaborative R&D projects. To summarize, research questions that would be attempting to broadly address are enumerated as follows,

1. Are there any differences in the role of BSE of industry-industry collaboration (especially, offshore software development) and BM of university-industry collaboration?
2. How different are their roles in both of these scenarios?
3. What are difficulties salient to cross cultural university-industry R&D collaborations, from BM perspective?
4. How are barriers to knowledge transfer (KT) in cross cultural university-industry R&D collaborations, viewed from knowledge creation or open innovation perspective?
5. Do these KT barriers, have any role in knowledge creation or open innovation?
6. What are perceived KT barriers, specific to R&D collaboration between developed and developing countries?
7. What are possible opportunities, in terms of addressing KT hurdles, which might enhance better KT and innovation in cross cultural university-industry collaboration?

Based on the above research questions, following research objectives were drafted for our study.

1. To understand differences in roles of Bridge SE in Industry-Industry software development collaboration and in R&D Bridge Manager in University-Industry R&D collaboration.
2. To understand crucial difficulties faced by Bridge Manager in University-Industry R&D Collaboration.
3. To understand important skills required for a good Bridge Manager in University-Industry R&D Collaboration.

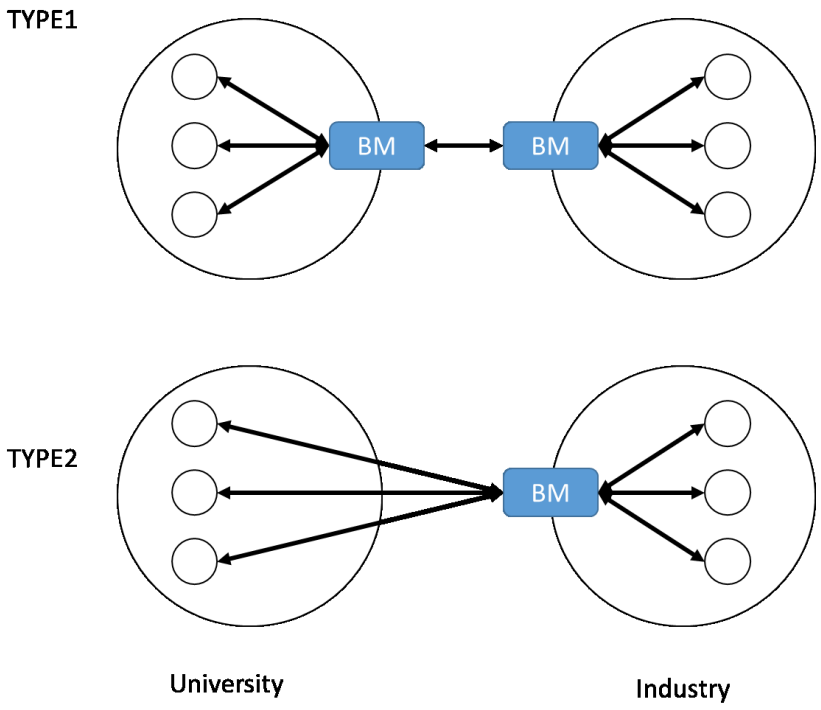

Figure 1. R&D Bridge Manager

In case of industry-industry collaborations, it is quite common that dedicated BSEs will be allocated from both collaborating companies and most of communications between companies would be streamlined by help of two BSEs, acting on both sides of collaborating entities. However, in case of university-industry collaboration, it is quite prevalent that BM are appointed only from industry side, who must be instrumental in coordinating activities from both sides viz., the universities and industries, as a single person-of-contact. This scenario has been depicted in Figure 1, above. While Type 1 collaborations is popular with industries and some cases of universities, Type 2 collaboration is quite unique to university-industry collaborations.

Methodology

Our study adopted a series of face-to-face semi-structured interviews with Bridge Managers. The sample consisted of Bridge Managers who had work experience with extensive work experience in multinational U-I collaboration set up were interviewed. Part of our sample consisted of Bridge Managers who are currently pursuing an academic career in a research university at Japan, having prior work experience as Bridge Managers with leading MNCs like Toshiba Corporation, Hitachi Ltd., Fujitsu Ltd. and IBM Japan. 45-60 minutes. Interviewees had at least 5 years of experience, working as BM with these leading MNCs. Another half of the sample considered in our study represents BM who are currently working between Japanese MNCs and

responsible for managing collaborative research activities with Japanese universities and other universities worldwide. Each interview consisted of 45-60 minutes. Interviewees were asked semi-structured open-ended questions related to perceived barriers to knowledge transfer in a context of multinational university-industry collaborations, perspectives on cultural gaps, important roles of BM in university-industry collaborations and skill sets essential for an ideal BM.

Interviewees were given follow-up questions with example scenario to get additional information pertaining to KT in multinational R&D collaboration setup. Skill sets of BSE from the literature were evaluated and discussed with Interviewees and additional skills they perceived important for a BM were documented. Interviews were audio-recorded and later transcribed verbatim. The qualitative method of content analysis was used to analyze the data obtained during the interview. Important themes providing insights on perceived barriers to KT and skill sets of BM were segregated.

Findings and Discussions

Qualitative findings of our study revealed that were huge overlaps between perceived barriers to knowledge transfer in multinational university-industry R&D collaboration setup and those experienced by multinational industry-industry collaboration setup, which could be either R&D oriented or project oriented. Our findings helped us arrive at subtle differences that would differentiate a Bridge System Engineer (BSE) from a Bridge Manager (BM), where the former works in conventional I-I collaboration setup and the latter works in a U-I R&D collaboration setup. Our study upholds the notion that while a BM has to be necessarily a BSE, a BSE need not be a BM, since BM might encounter a much sophisticated collaborative environment than that of a BSE. Ensuing sections would discuss on interviewees experiences and perceptions highlighting how I-I collaboration setup differs from U-I R&D collaboration setup and how BM operates in this collaborative environment.

University-Industry collaborative environment

Interviewees acknowledged that university-industry R&D collaboration setup was quite different from industry-industry collaborations. Primarily, interviewees expressed the differences in culture between university and industries at various levels. Interviewees' felt that universities were seldom aware of market and industry needs. Although this stance of universities is found to be decreasing and universities are found to actively engage in technology transfer activities with industries, industry personnel believe that universities ought to have a deeper understanding market needs and very importantly its culture to better address problems prevalent in the concerned market. As quoted by an interviewee,

> *"…very important was to know more about the market to apply the knowledge to actual product… How people are spending life, what is required and based on that knowledge, we can produce new products and services… in R&D environment it is very important for various people, culture, background and people, to understand each other…"*

Moreover, some interviewees opine that understanding universities' policies, regulations and priorities have a huge impact on successful transfer of knowledge between universities and industries. Conflicts of interest arising in sharing of intellectual property between the collaborating entities are found to be a huge hurdle in efficient transfer of knowledge between universities and industries.

> *"We industry people, put more importance to patents. But still there are many professors, who would not understand the importance of IPRs. They may be like, if you're not interested in productization, then patents are of no use. But as I said, if you think about the productization, is very important, then IPR is very crucial…"*

> *"From industries' perspective having a joint patent with universities is very tricky and almost infeasible. It greatly restricts our (industries) freedom to utilize the knowledge for our commercial benefit and competitive advantage…"*

Our findings supported that although language and cultural differences between universities and industries in multinational collaboration have a huge impact on successful KT, managing budget and timeline also emerge to be a very challenging task for industries. While business collaborations within industries are mostly contractual, terms and conditions dictating ownership of IP, shares in profit and other clauses will be clearly defined upfront. However, in the case of university-industry collaborations, the financial transactions are mostly in terms of supports and grants, which actually have notable implications for managing funds, clearly drafting ownership over IP and other crucial terms essential for the business environment. At times, awarding grants to universities becomes difficult for economies like Japan, as compared to US university-industry collaborations, where huge funding in scale of thousands of dollars is common and thus such scenarios become infeasible or quite rare for Japanese university-industry collaboration setups. Subsequently, university-industry collaborations are sought for a long-time sustained relationship with futuristic benefits to business. However, interviewees strongly believe that maintaining some kind of time frame to complete a particular collaborative activity could greatly help industries since the market is so dynamic and rapidly changing. Industries have to cope with this dynamic environment, needs timely inventions to maintain their competitive advantage in the market and once a product is failing to hit the market at the right time, the business is lost forever.

> *"…university people do have some time constraint. But it is completely different from constraints of industry. In industry, if you miss the time, you won't get any money out of market. It is more serious, and especially in dynamically changing technological environment, time taken to bring a product to market is very important…"*

Skillset of BM

Interviewees of our study upheld various skillsets.

They highlighted that skill sets expected of a good BSE are applicable and essential for all BMs as well. As an interviewee mentioned, "…a BM has to be like a superman. He knows everything, he has power to do anything…" Good communication skills viz., technical and non-technical communications, good domain knowledge on both collaborating sides, negotiation skills, debating skills, being an expatriate, knowledge on local economic and infrastructure, flexibility and adaptability, open-mindedness, leadership qualities, motivating personality, ability to establish flat organization structure, empathy sharing are perceived as skills essential for a good Bridge SE. While a BM is expected to have all these skill sets, complexities of university-industry collaboration environment necessitates BM to understand differences in priorities, cultures and constraints of two different entities i.e., universities and industries. A good BM has to understand university setup very well in order to smoothly coordinate with professors and as well as business managers to successfully transfer knowledge in such collaborative environment. BM should be well aware of university policies dictating the protocols involved in collaborative research activities and funding allocations, time line management issues pertaining to university research activities. Following quotes from interviewees supports these stances,

> *"…But when the U-I collaboration is conducted, the language is more different than industry-industry collaboration. Technical language difference is always there. Meanings are different…"*

> *"…I should learn both cultures equally. I came from business sector, but first of all I need to learn university culture, system, policies and everything. So I think, like BM should learn both sides…"*

Added to difficulties faced with differences in language, BM interacting between universities and industries should be fluent in technical language across different hierarchies of both collaborating sides, as well as across collaborating disciplines. An interviewee expressed that,

> *"…a BM has to know that same terminology used by physics professor and electronics professor could slightly differ in meaning, depending on their expertise and context. Moreover, BM has to be aware of terminologies and keywords across various hierarchies of people within both institutions, like managers, CEOs, CTOs, engineers on industry side and professors, students and support staffs at university level. Thus it is a complex set of links between multilayered people…"*

The interviewee added that BM's roles doesn't stop with understanding university research setup but also motivate professors and research students towards successful completion of

collaborative R&D projects. BM should be aware and accommodative of professors' freedom of research and manage time constraints in delivering outputs during various stages of collaborative R&D projects.

Developed and developing countries collaborations

Although many interviewees didn't feel any specific barriers to successful knowledge transfer between university and industry setup across developing and developed economies, few interviewees highlighted the importance of skills mismatch between entities of collaborating countries. As mentioned by an interviewee (country X being a developing country),

> *"…Excellent technology is brought into country X. But after few years, such systems would collapse. We need some maintenance. For maintenance we have to educate some technician in country X… That maintenance technician in country X believed our technologies never collapsed. But I tell them sorry, I ask them to first learn more about the equipment and how to maintain it. These kinds of variations in skill levels made some difficulty…"*

Other interviewees, however, acknowledged that many differences are prevalent in collaborative setups between developing and developed economies. They might include differences in legal structures, infrastructure, people skill sets, non-availability of adequate supply chains, non-availability of technologies, market need differences and industrial standards mismatches.

Scope for improvement

Interviewees strongly believed that BM has a huge role in facilitating a harmonious ecosystem for smooth transfer of knowledge between universities and industries spread across geographical boundaries. As an interviewee mentioned,

> *"…I think, "BA" which means a place or environment, where knowledge is created and exchanged. For e.g. some opportunity to work together, such kind of BA should not be in Indian side or Japanese side. We should find some another BA in developing countries outside Japan & India. Thus we sometimes believe Japanese values are best in world and also Indian people believe our culture is long and big. They believe these cultures should be best one. But inside every country, they believe like that. Outside you can feel and learn different cultures. If you and me go into Africa and try to get some problems solved in Africa, we should learn together with African culture and civilization or something like that. That makes work together, I think, that condition will give some important opportunity to believe each other and to learn about each other. So the coordination becomes more effective…"*

BM should also facilitate proper understanding of "KACHIKAN" meaning "values and priorities" in Japanese, between collaborating countries and entities so that successful transfer of

knowledge could be achieved. An interviewee hinted that establishing multicultural universities, which has students and faculties working from different cultures, regions, and nations can greatly minimize efforts of BM. He strongly believed that such multicultural university setups already would have overcome cultural barriers to some extent and it is easy to collaborate with such kind of students as well as faculties. Also, he emphasized that it becomes important in this context that young minds from various nations should travel and interact with many cultures to have a better understanding and ease the process of knowledge transfer in future. As mentioned from his quotes,

> *"…it is very important to have an international kind of education in elementary and middle school, so that they become internationally adaptable to tackle those situations with differences between two regions. To make it change rapidly, it would be one of solution to dispatch young people in different culture. For e.g., dispatching Japanese people to India and inviting Indian young people to Japan to understand Japanese culture in both ways could accelerate the process towards knowledge creation…"*

Some interviewees had an opinion that having a uniform university evaluation mechanism could greatly normalize the efforts of a BM in collaborating with universities from different regions. As quoted by an interviewee referring to two countries A and B.

> *"…research portfolio evaluation mechanism is with country A, not with country B. So having such setup will be nice if country B also has that setup and we can expect same standards of operation and protocols across various regions…"*

Added to these scopes of improvements, interviewees also supported the fact that support of information technologies like teleconferencing could greatly bridge the differences between collaborating entities across various regions of the world. However, they also have a strong belief that frequent visits to collaborating institutes and adequate timely feedback could also greatly help an effective transfer of technologies between universities and industries.

Conclusion

The study gave insights on complexities that surround a U-I collaboration in a multicultural setup. With differences burgeoning at various levels of U-I collaboration, BM's knowledge on differences in "Kachikan" between collaborating entities can greatly improve KT between university and industries. Understanding cultural, language and individual level differences between universities and industries have been upheld as vital for BM in multicultural U-I collaboration. BM finds IP conflicts as an important barrier and thus understanding of licensing policies of universities and legal framework of collaborating countries can greatly benefit BM's performance. The study was aimed at providing implications to collaborating entities, viz., universities, industries and coordinating entity the Bridge Manager. Insights from interviewees' perception could help universities amend their IP and licensing policies to facilitate easy transfer of knowledge between universities and industries. Secondly, industries planning for a

collaboration with universities can employ appropriate BMs who has an understanding of both university and industry culture at societal, organizational, and individual levels. BMs who strive to become more competent in bridging R&D collaborations between universities and industries may harness the necessary skill sets highlighted in this study to better their capabilities as a better BM.

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