From Literature to Practice: Selection Criteria for Industry-University Partners

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Abstract—**To strategically exploit open innovation, many companies continue to expand their research collaboration with universities to boost the novelty and speed of innovation development. Recently, literatures propose various sets of criteria for selecting universities as partners but the research on practicality and generalizability of such applications are still limited. This explorative study reveals how managers apply the criteria from literature into the practice for their industry-university collaboration. The structured interviews were conducted and the quotations were extracted to obtain common criteria. The result of case studies reveals that both systematic and traditional approaches are applied in partner selection. With a systematic approach, the academic databases and partner profiles are used along with expert judgment to support the decision whereas a traditional approach relies on trust which emerges from collaboration experiences and personal connection.**

I. INTRODUCTION

Many companies realize that a technology market today is overwhelmed by intense competition and fast advancement of knowledge while their internal resource and capability are limited. With the popularity of an open innovation concept that first introduced by Chesbrough [1], several managers rely on this alternative approach and pursue it in order to seek advanced technology and knowledge outside the firm's boundary and integrate them with its internal R&D assets and capabilities. His recent survey also reveals that large companies increasingly develop innovation through cooperating with outside actors and they value internal employees, customers, universities, suppliers and customer as top rated significant partners while external consultants and competitors are least important [2].

With such various types of companies, many managers pay attention to universities as the partners of joint R&D [2-11] with the motivations of the benefits of open search strategies [10], the growth of commercialization policy among leading universities [12], and the increasing role of government interrelated in an university-industry relationship (a.k.a. the triple helix model) as the sponsor of financing grants in joint industry-university research and as the regulator to pursue and control national economic and innovation development policies [13-15], the growing trend of venture capital and the widespread diffusion of leading-edge knowledge produced by universities [16].

Although much research on university-industry collaborations in various aspects can be found, the demand of practical implications has been identified as a research agenda [17-19]. In particular, some researchers have addressed the applications of partnership management in the context of university-industry collaboration. For example, Perkmann and Walsh [14], Du et al. [4] and West et al. [20]. However, the journey of successful collaboration with academia starts with the decision of how to identify the appropriateness of potential university partners but the set of criteria that managers use today still appears scattered and vague [21, 22]. Moreover, the research on the application of such criteria is scarce.

Therefore, this paper tends to extend the understanding of university-industry collaboration studies in the aspect of application by illustrating through the case study of two leading Thai companies. The cases highlight the criteria that managers consider to select the university as the partner in their joint R&D projects. The article is structured as followed; section II presents a thorough review of university-industry collaboration literature and Section III describes the research methodology. Section IV, we exemplify the set of criteria which managers of case study companies consider to select the university partners. Finally, the managerial implication and academic contribution are discussed, and then followed by the conclusions.

II. LITERATURE ON UNIVERSITY-INDUSTRY COLLABORATION

In the setting of university-industry collaboration, large companies often act as outside-in players who bring in and integrate external complementary knowledge and technology with their internal R&D capabilities to develop innovation [23] while universities are regarded as the technology incubators who contribute the novelty of innovation [24-26]. Managers decide to implement joint R&D collaboration with universities with various reasons such as the search of leading edge knowledge [10, 16], the growth of commercialization of research among leading universities [12], and the supporting roles of government in an university-industry collaboration (a.k.a. the triple helix model) as the financial sponsor and as the regulator to pursue and control national economic and innovation development policies [13-15].

Several innovation scholars have long confirmed that academic institution is the producer of advanced technical knowledge such as Von Hippel [27], Powell [28], Simard and West [29] and Ankrah and Tabbaa [15]. Moreover, there is a consensus among researchers who conduct empirical studies that university is regarded as a co-producer of radical

innovation. For example, Mohnen and Hoareau [30] indicate that companies more relies on public research companies when they plan to introduce the radical innovation, Garcez et al. [31] state that companies invite universities to engage in their joint R&D when projects involve the production of basic science and the development of radical innovation which are lengthy and high uncertainty, Hall et al. [32] indicate that projects with university research point to *"new"* science, Belderbos et al. [33] and Bellucci and Pennacchio [34] agree that university is the crucial source of knowledge for companies encouraging radical innovation. However, Adam et al. [35] earlier pointed out that collaborating with universities is just a complement to firm's existing research rather than a substitution despite of an increasing R&D spending in university-industry research collaboration which is coherent with the later statement of Chesbrough [1] that open innovation concept is just the complementarity not the substitution of internal R&D efforts.

While academia engage in collaboration with industry with the motivations of to access new scientific capabilities and to receive funding and rewards [25], companies work with faculty researchers in a various forms of activities from research-related cooperation (e.g. research contract, joint research, cooperative research venture etc.) to non-research related cooperation (e.g. accessing honored graduates, co-developing curriculum and participating academic conferences etc.) [2, 36, 37]. Some scholars have categorized the variety of interactions. For example, Schartinger et al. [9] introduce four modes of joint research, contract research, mobility and training. Perkmann and Salter [38] propose four modes of idea lab, grand challenge, extended workbench and deep exploration. Each activity has diverse degrees of cohesiveness and different lengths of course from *'low relational involvement'* and shorter-term (e.g. research contract, publication, patents) to '*higher relational involvement'* and medium-to-longer term (e.g. collaborative research, informal networks) [14, 39]. Some researchers attempt to investigate factors affecting the decision of interactions. For example, Krahmer, F. and Schmoch [40] concentrate on the perspective of managers and find that they value higher on collaborative research and informal contacts and their decisions are not affected by the ranking of universities. Schartinger, D., et al. [9] focus on the degree of R&D intensity and unveil that industries with higher R&D ratio (e.g. chemicals, instrument) are more inclined to have high intensity of relations with academia (e.g. collaborative research, informal interactions). Moreover, Frietas et al. [41] point to the firm size and their empirical study reveals that large companies work with universities in an institutional mode (i.e. contacting through institutionalized infrastructures like research centers) while small companies cooperate with academia in a personal mode (i.e. directly interact with individual scientists through formal agreements).

Among diverse pairs of partnering companies, the essence of university-industry collaboration is distinctively characterized by these followings:

1) Primary missions of universities include publication records, academic services to society (e.g. academic conference, training etc.) and teaching workloads. The technical ability of university is thus related with the research quality and the applicability of basic science knowledge into marketable products [42-45].
2) A paradoxical tension of knowledge sharing and appropriation exists because the academic key performance index (KPI) of individual researchers is measured by free-reveal publication while companies attempt to protect research output as secrecy [14, 46-48].
3) Many joint R&D programs are mediated by administrative units founded by universities such as research offices, intellectual property offices and Technology Transfer Offices (TTOs) [14, 41, 47, 49].
4) Many universities have the bureaucratic working culture or *'academic clock'* which might affect the project scheduling [3, 6, 15, 45, 47, 50].

However, cooperating with universities is an attractive choice when a project requires intensive R&D efforts which exceeds firm's internal capabilities but companies might face excessive R&D budget and the risks of translating research into industrialization [31, 51]. Therefore, some scholars address the practice of efficient university-industry collaboration as the research agenda. For example, Du et al. [4] point out the university-industry relation management at R&D project level. Also, West et al. [20] indicate that the application of university-industry collaboration under open innovation strategy becomes a research interest. Perkmann and Walsh [14] stress the demand of practical ways to search well-matched universities but the available case studies of successful university-industry collaborations in an open innovation setting concentrate on how to orchestrate already searched-and-invited partners in joint R&D projects [6, 25, 38, 51]. It is true that the consideration of ways to smoothen the cooperation with well-matched universities is vital but the pre-requisite is the specific set of criteria to identify the appropriate university partners. To achieve this, relevant literature has been collected to list key criteria that authors regard as the necessary features of university partners as shown in Table 1 below.

TABLE 1: KEY CRITERIA USED FOR UNIVERSITY PARTNER SELECTION

Criteria	*Description*	*References*
Research expertise	Faculty researchers are the research masters in their fields. With their research competencies, they can produce new science knowledge that potentially boosts the novelty of innovation.	Yoon and Song [4], Mohnen and Hoareau [30] Garcez, et al. [31], Mindruta [37], Fabrizio [52], Barnes et al. [53]
Translatability of research discovery	Faculty researchers have the ability to translate or commercialize the research findings into marketable products or any other types of outputs that correspond to the industrial demand.	Hall et al.[32], Siontorou and Batzias [43], Casper and Miozzo [51], Banal-Estañol et al. [54], OECD [55], Carlile [56], Kotha et al. [57]
Common knowledge background	Faculty researchers have common knowledge base at a certain degree that facilitates the communication and the knowledge transfer.	Reagans and McEvily [58], Cohen and Levinthal [59], Rothaermel and Boeker [60], Lane and Lubatkin [61], Lichtenthaler and Lichtenthaler [62], Svetilk et al.[63], Lakemond et al.[64]
The interdependence of research resource	Faculty researchers have lab equipment and/or qualified research assistants that are essential for collaboration.	Nohria and Garcia-Pont [65], Vanhaverbeke, et al. [66], Douma et al. [67]
Compatible strategic goal	The goals of an open innovation project are compatible with the academic goals or motivations of faculty researchers in all aspects such as publications, teaching improvement and research funding.	Ankrah and Omar [15], Carayol [68], Lee [69], Stern [70], Boufreau and Lakhani [71], Antikainen et al. [72]
Adaptability	Faculty researchers are flexible and be able to cope with changes and pressures in cooperation and business environment.	Chesbrough [1], Dunford, et al. [73], Emden et al. [74] Grindley and D.J.Teece [75] Buganza and Verganti [76]
Agreements on IP management	Faculty researchers comply with the firm's intellectual property management policy. No conflicts of agreements on intellectual property ownership.	Ades et al. [3], Freitas et al.[41], Bogers [46], Carlsson et al. [48], Salter et al. [77] Ahuja et al. [78] Cassier [79] Bruneel et al.[80]
Compatible working style	Faculty researchers are accustomed to an organizational culture. Also, they meet the requirements of commitment and contribution.	Ankrah and Omar [15], Hall et al. [32], Mindutra [37], Bogers [46], De Brentani and Kleinschmidt [81]
Past relationship	Faculty researchers have experiences of collaborating with the focal firm. Close relationship can build the trust and smoothen the interaction process.	D'Este and Patel [7], Ankrah and Omar [15], Bogers [46], Petruzzelli [82], Barnes et al.[53], Kotha et al.[57], Bruneel et al. [80], Tai Tsou [83], Abramo et al.[84], Nielsen [85]

From nine criteria shown in Table 1 above, the research question to be addressed is how managers bring each of them into the practice of university partner selection. To correspond this, the case studies research is chosen as a strategy which its methodology will be described in the next section.

III. RESEARCH METHODOLOGY

From the literature, this study employs the qualitative research with two case studies approach. Primarily, two companies were selected as representatives of a pilot study. The data collection was carried out by a series of structured direct interviews and some follow-up phone talks with top managers who select partnering universities to participate in their joint R&D projects. A set of structured interview questions has been developed by referring from pertaining literature in order to highlight key criteria that managers apply for university partner selection decisions. All interviews were conducted during June-September 2015. The results have been transcribed and extracted to connect the managerial practices with key criteria mentioned in relevant literature.

IV. CASE STUDIES

This section describes the set of criteria obtaining from two separate case studies coupled with relevant literature. The data collection was carried out through interviews with managers from two companies who search and invite partnering universities to engage in their open innovation projects. The informants were primarily asked about the criteria they consider to select universities as co-researchers for joint R&D projects. Company A and B are the representatives of companies from petrochemical and food sectors respectively. The brief descriptions of their profiles and experiences of collaborations with universities are displayed in Box 1 and 2 below.

Table 2 below shows the list of nine common criteria coupled with related key quotations which were extracted from interviews.

Box 1: Company A

It is an integrated petrochemical and refining manufacturers with a total Olefins and Aromatics production capacity of almost ten million tons per year and distillation capacity of almost 300,000 barrels per day. This company has more than ten branches of offices with over 3,500 employees and its 105 of R&D personnel. Science and innovation is one of its functional units established to promote its vision of being an innovative firm. Its R&D unit adopts several open innovation projects in the form of collaborating with academia to develop its specialties chemicals. Its university partners are from both domestic and foreign countries (mostly in the U.S.) as well as with its own founded higher-education institute in science and technology.

Box 2: Company B

It is a manufacturer of canned seafood selling in both domestic and international markets such as Asia, Europe, U.S.A. and Middle East. It recognizes the innovation as one of integral parts of its business model corresponding to the dynamic of consumers' behavior and the organizational policy of continuous improvement. Consequently, its concentration of innovation leads to high product quality that matches with worldwide standard. This company has one head office in Bangkok and one plant upcountry with about 1,028 employees in total and 4 of R&D employees. This company practices an open innovation concept through joint R&D with faculty researchers from domestic institutes in order to invent new products from waste fish oil and to improve packaging functions.

TABLE 2: NINE COMMON CRITERIA AND RELATED KEY QUOTATIONS

Common criterion	***Key quotations***
1. Research expertise	**Company A:** Today, we have our own technology scouting team who search for researchers specializing in our research interests. We use public information to determine them in terms of their publications patents, and talents. …We view that when there is no basic research work, applied research will not then emerge because applied research will tell us its application, right? If there is no novelty *(from basic research)*, no translation from basic research to application. *(Our)* industry has a problem, and that solution must come from basic research which is developed from a certain knowledge base. But if you *(scientists)* say, hey, I do not have that sufficient knowledge base. When we want to bring some knowledge out to use, we do not have any to do so. Then, that problem cannot be solved. It is like two-way. Yes, basic research is necessary but you (professors) should have some kind of platform which our country requires. Also, we search academic-based data like publications and citations to find quality paper is done by what university and how it is translated into intellectual property. We also observe it in a form of timespan. When we see intellectual property, we can tell how many years that basic work has been translated into commercialization. It tells us a company who holds that work. If we map it carefully, we will see the entire picture from the starting point of development to commercialization. We will see the positioning, who is working in what stage. **Company B:** We need scientists in the field of pharmacy because we need to innovate fish oil capsule from our waste of production, not just ordinary fish oil but odorless fish oil. It requires some kind of pharmacy-related nanotechnology and mechanisms which we lack of that in-depth knowledge.
2. Translatability of research discovery	**Company A:** They (academic researchers) always do what they are used to do. If I say that our research interest is close to your expertise but you might have to slightly adjust your work. They often start hesitating and ask 'what benefits I got after I modified because I do basic research as my career'. So, I think many universities should adjust their mindsets that basic research, yes you can do it but can you just slightly modify? Let our industry as a central. This is why we establish our own corporate university which nobody does yet. No companies starts developing some kind of frontier which is the mix of basic and applied research. There are lots of users of this frontier but it is very new for Thailand. **Company B:** Finally, they (scientists) found the solution of how to encapsulate our fish oil. They accomplished what we want and they received an innovation award from National Innovation Agency (NIA). But this project today becomes paralyzed. We do not bring the research discovery into commercialization and upscaling because it requires massive budget to establish new manufacturing process.
3. Common knowledge background	**Company A:** …*(Our)* industry has a problem, and that solution must come from basic research which is developed from a certain knowledge base. ……In the process of engagement, it takes some period of time to get to know them and know what they are doing. It is like both sides are selling something. We tell you (scientists) why we want to work with and we need the details of your research work. It is like a roadshow of each other, we approach you and you approach us. **Company B:** We targeted on the faculty of pharmacy because we need to encapsulate fish oil which relates to their field. However, we also expect that professor have some degree of knowledge about nutrition.
4.The interdependence of research resource	**Company A:**..It is case by case. Given that this is our problem and this is our process. You just solve this. We view that the solution should belong to us but scholars receive research funds from us and they can spend this money to hire students or do whatever. Then their works get published and get intellectual property also. But if this problem comes from the interdependence of contribution from both sides. When we cannot find some solutions and our partner university can do it for us, we share the benefits based on the proportion of resource contribution. For example, we agree on 50-50 for this research output. I think it is case by case and I think it is on fair basis. It means that who

	contributes what for this collaborative project. If you can find solutions that we do not require, we are fine to share the benefits of research discovery. **Company B:** For this project, our partner academia did research and we supplied what they want like sampling units (fish oil from production). They knew the problem we wanted to solve and we supplied what they need like a batch of products or waste fish oil and so on. Meanwhile, they did research by using their laboratory equipment and facilities. We felt more convenient because we do not have all laboratory tools and equipment they want.
5. Compatible strategic goal	**Company A:** Sometimes, they (scientists) worked too slowly and they did not understand what we were discussing. For instance, they asked why we often changed the scope of work. Actually, after we have identified problems and conditions, we normally change the requirements overtime. Every three or four years. I think that it is the process that both needs to mutually understand. Was it failed? No, it was not. But I think when we expect that this project can be accomplished in a short time, it always takes longer time. The faculty sometimes got annoyed by us. They asked why we changed the requirement so often, why we followed up their works so often. For submitting work at each milestones, if we do not talk clearly. We both then misunderstand. The faculty said "oh, I thought you expected the work like this". We are o.k. with that and accept it as our lesson. We learned that when we develop a proposal or POR, we need to ensure that the proposal is clear and the detail is also compatible with their academic goals. We view that it was not the failure and it was not that we cannot collaborate. **Company B:** When we informed our requirements to researchers, they understood and planned the project milestones for us. They accomplished every milestones corresponding to our goals and they request to reveal some part of work in their publications which we are o.k. However, they could not scale it up. So we cannot reach the next target. Actually, scaling up was not developed because we had a budget limitation. Moreover, we still cannot identify where and when is the end of project. When we cannot specify our goals, they cannot plan the work for us. However, this project was so innovative and challenging. It was not easy but they achieved it. They met our minimum requirements.
6. Adaptability	**Company A:** For collaborating with universities, the working system of Chulalongkorn University is better than of others. It understands how to work with industries and when we compare with other foreign universities, the working system of Chulalongkorn University is satisfied. **Company B:** Luckily, our partner researchers are flexible with both changes in our requirements and in our industry as we expect. They understand the overview and trends of healthcare and food product market. We need 'odorless' as our differentiation of fish-oil capsule market. They realize it and attempt to achieve what we want.
7. Agreements on IP management	**Company A:** Chulalongkorn University has a solid system. It has a specialized unit who manages intellectual property systematically. …. If that candidate university is on our list, we are glad to work with. It is easy when we approach, we hardly do contracting because we and a university already have a mutual master contract. If we can choose, we prefer the easier one. But if it is very critical and we cannot find specialists, it becomes the further process. …actually when industries decide to cooperate with academia, companies already realize the tension between intellectual property and academic contribution. And the point is that when the research output is managed in the form of intellectual property or any other forms. The question is how it is used. The company has to protect it. We have to negotiate with professors on how we can share it, in terms of the ownership and its consequent benefits. We truly understand that universities concentrate on their academic KPI such as publications or whatever. It might affect our agreements. For example, when we have something new emerged during joint R&D process and we desire to patent it, professors reject and say 'No, you can't patent it otherwise my graduate students cannot get their works published'. At that time, we did not understand. They asked us to get this research published but the problem is that we cannot patent it if it has published. For the case like this, we felt it is hard to negotiate. But now, there is a system which says 'o.k., for how many years to protect this research outcome or you can use the patent as the indicator for your academic KPI'. **Company B:** Our firm manages intellectual property rights with some of our product lines because canned fish is the mass product that we cannot license. But we have the production line of snack products. We have our own baking machines and frying machines that are so unique that we need to manage IP with them. For the case of fish-oil capsule project, it does not relate with our current production line. Therefore, we do not have any leakages of our know-how. Everything in this project is new for researchers and new for us. We can accept that the faculty desires to reveal some part of knowledge outcome of this research through their publications. But if we can apply this knowledge outcome and commercialize it as our final product, we will definitely negotiate with the faculty of how to manage IP with it.
8. Compatible working style	**Company A:** … Yes, we have the problems of difference in working culture and project scheduling. As for working culture, it depends on their working experiences with private companies. If professors never work with industries, we have to think for how long to break the ice and to minimize the differences. We go back to determine their motivations like if they have teaching workloads, academic KPI like publications etc. We attempt to estimate that how they can contribute their time and efforts for us. We develop a proposal and ask them the possibility to contribute their work time just 50% or 20% at least. Is it possible in the reality, maybe not. We have to calculate how much time those professors can spend for our project. **Company B:** It did not take a long time to adjust the working culture as we expect because they are familiar with our internal R&D team. Some of our R&D members have personal relationship with them. Besides, we know nothing about capsule and our partner faculty fully contributed to us both in terms of knowledges and solutions. When we had to present this project to National Innovation Agency (NIA) for budget approval, they were glad to support us such as the project details, the knowledge outcome and so on.
9. Past relationship	**Company A:** …If that candidate university is on our list, we are glad to work with. It is easy when we approach, we hardly do contracting because we and university already have a mutual master contract. If we can choose, we prefer the easier one. But if it (the project) is very critical and we cannot find specialists, it becomes the further process. **Company B:** Some of our internal R&D team members used to study here *(at partner university)*. They feel comfortable to work with acquaintances. Besides, we are comfortable to work, batch or test the experiments together.

V. DISCUSSION

To facilitate the discussion, nine common criteria obtained from the interviews have been organized into two groups of research-related and non-research related criteria (see Table 3 below) and we will use these two groups as a guideline to dispute three major lessons learned from interviews.

TABLE 3: TABLE OF TWO CATEGORIES OF RESEARCH-RELATED AND NON-RESEARCH RELATED CRITERIA

Research-related criteria	*Non research-related criteria*
1. Research expertise 2. Translatability of research discovery 3. Common knowledge background 4. The interdependence of research resource	5. Compatible strategic goal 6. Adaptability 7. Agreements on IP management 8. Compatible working style 9. Past relationships

Lesson 1. Research-related criteria and the systematic approach vs. traditional approach

Although some authors propose the records of publications and patent citation as the indicators of academia's research competency in their university-industry matching models e.g. Banal-Estañol et al. [54] and Mindruta [37], we find that it is applicable for company A but not for another. Company A uses the systematic approach which involves the use of academic databases along with expert judgments. It established an isolated unit of technology scouting responsible for analyzing the records of patent citations and publications from various academic databases. The result of analysis is then reported to managers for evaluating the research competency of faculty researchers. At the other end, company B uses the traditional way which relies on the use of personal connection. Managers invited its R&D members to recommend potential faculty researchers and then together discussing to assess their research capabilities. Although different techniques were applied, managers from both companies were satisfied with the research outcomes produced by their partnering academia.

Lesson 2. Non-research related criteria and the use of partner profiles.

Besides research-related criteria, both sample companies also consider other five of non-research related criteria of compatible strategic goal, adaptability, agreements on IP management, compatible working style and past relationships. Our another finding reveals that company A determine these five criteria by the use of its comprehensive records of partner profiles while company B does with the use of trust. At company A, it analyzes the research interests of faculty to ensure the compatibility of academic goals and its project objectives. Moreover, the research commercialization policy of university and the systematic process of its founded intellectual property management office are used as the indicator of academia's adaptability and the alignments of agreements on intellectual property. Also, company A considers the researchers' motivations to ensure the compatible working style and prioritizes candidate universities with past relationships to secure the smooth cooperation.

At company B, managers reveals that they discuss with internal R&D teams to assess the appropriateness of candidate universities. For the joint research and development of odorless fish oil capsules, its partner university was selected from the recommendation of internal R&D members with the reasons of past experiences of collaborations and close personal relationships. Moreover, managers asked for this partner university to develop the research proposal and set the project milestone since it truly lacks of in-depth product knowledge of dietary supplement. Also, the company B allowed its faculty partners to reveal some of research outcomes in their publications.

Therefore, both companies also consider non-research related attributes of candidate universities but company A evaluates by the use of partner profiles while company B relies on personal trust. Although the use of partner knowledge is found at company A, managers did not mention the use of any advance techniques to quantify them like they do with the assessment of research competency as previously discussed. This might lead to the incompleteness of partner knowledge transfer between managers and within R&D team. Therefore, all criteria should be quantitatively measured and clearly communicated to internal R&D members or next R&D managers who will lead future joint R&D projects. Nevertheless, Manotungvorapun and Gerdsri [86] already propose an approach to quantify subjective criteria and visualize the partner profile in the form of radar chart which assists the partner selection decision.

Lesson 3: The limited applicability of geographical proximity factor

Even though some authors confirm that the performance of collaboration is influenced by geographical distance e.g. Fabrizio [52], Bogers [46] Petruzzelli A.M. [82] and Funk [87], our pair of case companies did not mention the consideration of this factor. Thus, the generalizability of geographical vicinity determinant might be limited based on the case study. Some authors argue that geographical proximity by itself does not influence the learning function of innovation development. For instance, Arundel and Geuna [88] find that spatial proximity cannot be used to explain the demand of tacit knowledge because companies who value the informal contact consider domestic sources less significant, and use their connections outside the firm's home country to access new knowledge. Also, Boschma [89] claims that geographical proximity is neither a necessary nor a sufficient condition for absorbing knowledge, and the importance of geographical proximity cannot be assessed separately but rather examined with other dimensions of proximity (i.e. cognitive, organizational, social and institutional).

From three lessons discussed above, we find the different applications of criteria and the limited applicability of

geographical factor. Since this project is the pilot study of two case companies, the further examination of other contexts (e.g. regions/countries of studies and other types of partners rather than universities) with more case companies is recommended to improve the generalizability.

VI. CONCLUSIONS

This explorative study contextualizes the practice of research collaboration between university and industry. The study illustrates how managers consider the appropriateness of their university partners. This paper starts with a thorough review of literature on university-industry collaboration studies. Then, we list major criteria collected from extant literature and connects them with extracted quotations to show how managers apply each criterion into the practice of university partner selection decision. The key finding is that both systematic and traditional techniques are applied in the university partner selection. The systematic approach involves with the evaluation of research-related criteria from the use of academic database coupled with expert judgments and the assessment of other non-research related criteria from the determination of partner knowledge (e.g. the research interests and motivations of academia, the procedure of the intellectual property management office etc.). Meanwhile the traditional method relies on trust which emerges from the collaboration experiences and personal connection.

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