


A Preliminary Examination of Stimulating and Building University-Industry Collaborative Works at a Public University

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Abstract – Vitalization of University and industry collaboration (UIC) is at the forefront of higher education policy making at institutional and national levels. It benefits both the industries and higher institutions with the sharing of expertise and knowhow. Industry players are investing in innovation, research and development to stay ahead of global competition. It is with this lead of future potentials and opportunities that this study was conducted on university and industry collaboration between Universiti Tun Hussein Onn Malaysia (UTHM) an anchor institution located in Batu Pahat with the industries. The respondents are the Deans, Deputy Deans and Head of Departments. Sources of external funding, adequacy of laboratory equipment, types of services offer to the industry, nature of UIC interaction and coordination were reported. Discussion and suggestion of approaches to UIC from the findings reported in this paper were also drawn from previous works and the authors' personal knowledge and experiences for stimulating and building collaboration works.

Keywords - University-Industry Collaboration, Batu Pahat, UTHM, UIC, university, industry

I. INTRODUCTION

Knowledge and technology innovation are known source of global competitiveness leading to economic growth and development. This has elevated the importance of University and industry collaboration in higher education policy-making at both institutional and national levels. Universities and industry interact in various ways. The most common is in the form of collaboration, other forms include engagement in academic, commercialization, patenting, spinning-off works. Collaboration work comes in the form of joint research, contract research and consultative works and highly valued and most common form of university-industry engagement [1], [2].

[3] reviewed the need for further research work that focuses on the process of formation, development and effective coordination of UIC. Hence, this study is a preliminary work related to examining the works of UIC of a Public University, an anchored institution in Batu Pahat town. The findings and recommendations on approaches to stimulate and build UIC works of this study could

give decision makers on leveraging and addressing university-industry collaboration efforts appropriately.

II. LITERATURE REVIEW

Since the 1970's, UIC has become formal, frequent and planned. It has become the interest to both developed and developing countries governments and policy makers [4]. University and Industry collaboration can be in term of knowledge transfers between the university and the industry. It could be in political, economic, managerial and academic interest [5]. University and industry knowledge transfer activities have greatly increased in the last few decades [6]. Collaboration between both university and industry helps improvement and innovation of the industry with the relevance academic research [7]. Knowledge transfer and strategies of collaboration and characteristics of collaboration are popularly being discussed in literatures (2006-2012) [3]. Industry relevance, academic rigidity and the issue related to internship are among other issues discussed. [3] also reviewed that UIC in Malaysia and other countries are given high priority of forging close collaborations and is attracting lots of attentions.

[8] had proposed a typology of university-industry interaction. It is about the relationship between the entrepreneurial orientation of university and the extent of relationship. The typology is one of the evidences that university has evolved from the traditional roles of merely educating human capitals and pursuing intellectual to the modern roles of being more economic oriented.

Typology of University-Industry Interactions suggested three types of relationship between university and industry namely Type I, Type II and Type III. Type I relationship is short-term relationship that usually involved indirect interaction. Such relationship includes knowledge transfer activities like seminars, workshops, training, publications, grants or donations and fellowships where the interactions are temporary and the understanding is shallow. Type II relationship includes contract research, consultancy and personnel exchange. Type II has longer period of relationship

which usually takes 1 to 3 years. This enables deeper communication which results in better understanding. Finally, Type III involved technical cooperation which usually takes a longer period of time. Type III results in development of science parks, incubators, spin offs and patent licensing.

UIC is made from the level of individual scientists, departments, disciplines and universities. However, there are still gaps in the literature on such relationships from outside of the science and innovation studies [9]. [10] affirmed the need to consider the institutional context prior to adapting regional and national levels of technology transfer works. There may be differences between situations and collaborative landscape between the institutions cause a particular model working well but not in another. As such it is necessary to consider the different factors influencing university technology capacity, transfer and commercialization.

Success of UIC is crucial in increasing the commercialization of technologies and research outputs which will increase the income stream for both parties. Quality of curriculum and employability of graduates can be improved as the gap between both parties is reduced [11]. From the perspective of policymakers, the future direction of UIC is crucial for deciding the direction of collaboration. Such policy decisions include the allocating research and commercialization incentives and grants, encouraging collaborative works between academician and industry engaging in partnerships and resources sharing through official knowledge transfer programme, development of excellence centers and research parks.

III. RESEARCH METHODOLOGY

Survey questionnaire was used to collect the data needed to achieve the research objectives. Discussion and suggestions of approaches to UIC from the findings reported in this paper were also drawn from previous works and the authors' personal knowledge and experiences for stimulating and building collaboration works.

The deans, deputy deans and heads of department who are decision makers at the University were chosen to respond to the survey questionnaire. The population size is 78. According to [12] on population and sample size, a population of 78 required a sample size of 66. A total of 80 questionnaires were distributed and only 30 duly completed forms were returned and used in the analysis.

IV. DATA ANALYSIS AND RESULTS

Table 1 tabulates the profile of respondents from the different faculties that responded to the survey questionnaire. A total of 16.7 percent (5 respondents) of the respondents are from ORICC, 10 percent (3 respondents) from FTK, 10 percent (3 respondents) from FSTPI, 10 percent (3 respondents) from FSKTM, 10 percent (3 respondents) from FPTV, 10 percent (3 respondents) from FKMP, 10 percent (3 respondents) from FKEE, 10 percent (3 respondents) from FKAAS, 6.7 percent (2 respondents) from FPTP and 6.7 percent (2 respondents) from University and Industry Relation Office. Overall, highest respond has been received from ORICC (16.7%).

TABLE 1
Respondents distribution at UTMH (n=30)

	Faculty/ Department	Frequency	Percent
1	University and Industry Relation Office	2	6.7
2	FPTP	2	6.7
3	FKAAS	3	10
4	FKEE	3	10
5	FKMP	3	10
6	FPTV	3	10
7	FSKTM	3	10
8	FSTPI	3	10
9	FTK	3	10
10	ORICC	5	16.7
	Total	30	100

A. Most common partners for R&D or consultancy project in past two years

According to Table 2, 63.3% of academicians of UTHM had collaborated with private industry and followed by public industry (60%) in R&D and consultancy projects during past two years.

As consultation and R&D are two of the most common activities in UIC (Stewart, 1990), the questionnaire was designed to show the most common partners for these 2 activities. Almost all the academicians who replied the survey had collaborated with external organizations in past two years. Out of 30 academicians who reply the survey, 19 academicians (63.3%) had collaborated with private industry. 18 academicians (60%) had collaborated with public industry (refer Table 2). The combined or cumulative, percentage for most common partners for R&D and consultation projects is 84.1%.

Overall, the most common partners for R&D and consultation projects of academicians are private industry and public industry. It accounted for 84.1% of the overall R&D and consultation projects.

TABLE 2
Most common partners for R&D or consultancy project in past two years (n=30)

Item	Response
Industry (private)	63.3%(19)
Industry (public)	60%(18)
NGO's	16.7%(5)
International agencies	3.3%(1)
Others	3.3%(1)
Private foundations	0%(0)

B. Status of external funding

Table 3 tabulates the status of external funding received by the UTHM. It indicated that the rate of receiving external funding is 100% which means all the academicians had received funds from external sources.

TABLE 3
Status of external funding (n=30)

Item	Frequency	Percent (%)
1 Received funds from external sources	30	100.0
2 Not received funds from external sources	0	0.0
Total	30	100.0

Funding is one of the most common activities of UIC with direct interaction between U-I [13]. All the academicians who replied to the survey had received funding from the external sources (refer Table 3). Table 4 tabulates the most common sources of external funding received by academicians. Out of 30 academicians who replied to the survey, 11 academicians (36.7%) had received funding from public industry. About 10 academicians (33.3%) had received funds from private industry. The combined or cumulative, percentage for most common sources of external funding is 72.4%.

TABLE 4
Most common sources of external funding received by academicians (n=30)

Item	Response
1 Industry (public)	36.7%(11)
2 Industry (private)	33.3%(10)
3 Others	20.0%(6)
4 Private foundations	3.3%(1)
5 NGOs	3.3%(1)

Overall, the most common sources of external funding received by academicians are from public industry and private industry as it accounted for 72.4% of the overall external funding.

C. Most common forms of coordination of UIC in UTHM

As shown in Table 5, most of the UIC activities in UTHM are contributed by 3 groups. They are the research groups (comprising Center of Excellence and Research Centers), individual effort and University and Industry Relation Office. From the 30 academicians who had replied the survey, 80 percent of them (24 academicians) indicated that most of the activities of UIC are coordinated by research team, 66.7 percent (20 academicians) indicated that most activities are coordinated by individual effort and 60 percent (18 academicians) indicated that these activities are coordinated by University and Industry Relation Office. Overall, the most common form of coordination of UIC is through research team.

TABLE 5
Most common forms of coordination of UIC at UTHM (n=30)

Coordinator	Response
1 By research team	80%(24)
2 By individual effort	66.7%(20)
3 University and Industry Relation Office	60%(18)

D. Adequacy of laboratory equipment

Table 6 shows the adequacy of laboratory equipment at the UTHM. It is crucial to look at the capacity of each faculty in the university to undertake research and development work for the industry. From the point of view of the academicians, 86.7% stated that facilities available in the university particularly laboratory facilities are adequate for teaching. This implied that university is capable in collaborating with the industry for employees training and growth. 43.3% stated that the facilities in the university are adequate for research. This implied that university is capable in collaborating with the industry in R&D activities and laboratory tests.

TABLE 6
Adequacy of laboratory equipment in UTHM (n=30)

Equipment	Total Yes	Percentage (%)
1. Adequate for teaching	26	86.7
2. Inadequate for teaching	2	6.7
3. Adequate for research	13	43.3
4. Inadequate for research	7	23.3

E. Common types of collaboration with the industry

Table 7 tabulates the most common types of collaboration between UTHM and the industry. One of the main objectives of this research is to explore the current status of UIC between UTHM and the industry. It shows that consultancy, seminars, use of laboratories facilities and training program and workshops had accounted for 80% of the current UIC.

TABLE 7
Types of services offer to the industry from the perspective of academicians
(n=30)

Services	Total Yes	Percentage (%)
1 Consultancy	24	80
2 Contract research	14	46.7
3 Training program	12	66.7
4 Workshops	12	40
5 Seminars	14	46.7
6 Use of laboratory facilities	14	46.7
7 University patents	3	10
8 Prototypes developed by university	5	16.7
9 Others	1	3.3

V. DISSCUSSION, RECOMMENDATION AND CONCLUSION

This part focuses and explains about the results obtained from data analysis. Besides, some recommendations will also be stated in order to improve future related researches.

A. Discussions

There have undeniably been many dramatic changes in UTHM itself, Batu Pahat town, Malaysia as a nation as well as the global situations. UTHM has been in this Campus since 1993, and have gone through a number of phases since its inception. On February 1, 2007, UTHM officially obtained its full university status. It became part of the 4 Malaysian technical colleges that was built in the country alongside Universiti Malaysia Perlis (UniMap), Universiti Teknikal Malaysia Melaka (UTeM) and Universiti Malaysia Pahang (UMP). These 4 universities are expected to be the Apex universities in technical learning equivalent to the overseas technical and science applications universities.

Malaysia aspires to be competitive, more effective and more innovative. These would mean that players including universities and business community would make changes to stay competitive and innovative in tandem to the globalization needs and future ahead. A vital strategy to stay ahead of global challenges and infusing the region with human capital and technological development is through collaboration between individual faculty members, between internal academic departments, schools, colleges and universities, and most important, with local technical schools, colleges and universities of engineering, local and state government, and industry. The role of university in innovation works is elevating community's economic well-being and placing universities focal point of growth and opportunity.

Employers, universities and professional bodies agree that our nation needs to develop very skillful professionals who are ready to face the challenges of increased competition [14]. Professionals that are able to respond to technical, social, economic, cultural, and environmental needs and can work flexibly and intelligently across business in the current and future contexts towards contributing to the our country's prosperity and social capital. Contributing in the workplace would mean that our new graduates need to understand the role they play in the organization they work and possess the practical skills to effectively contribute in their role. In this sense, our universities have very much shifted its effort in training students on the application of a range of employability skills learned, engaging with the organization, its vision and mission, the dynamics of the workplace, and carrying out their responsibilities with informed knowledge of all of its requirements and through a range of experiences. At the UTHM, there are programmes like starting school, finishing school, student industrial internship, structure internship programme, problem based learning, industry professional programmes to train these emerging professionals and others. The introduction of HEIGIP (High End Industry Graduate Internship Programme) and knowledge transfer programme are among other initiatives by Ministry of Higher Education to engage students with industry while they are at their early years in the University.

Education and continuous innovation are two keys to business growth, and both assist the capacity of nations to produce wealth. Collaborative efforts between academia and industry can create channels for training students and opportunities for graduates to apply their newly acquired academic knowledge to industry. Collaboration allows industries to explore potentially profitable new areas of research and development and enhances the visibility of academics to industry. Co-operation between UTHM and the respective Companies will provide the synergistic effect to help and advance mutual interest, that is for the university and the Company concerned.

There are many potential benefits to be realized when industrial firms and universities work together. Universities interact with industrial firms primarily to obtain basic research funding, industrial expertise, exposure to practical real world problems, and employment opportunities for university graduates etc.

At all the Malaysia Technical Universities Network (MTUN) universities, there is an Industry Community Relations Office. However, efforts to form partnerships with industry and community have largely been conducted on an ad hoc basis. Until the creation of this portfolio, there has not been a

structured way of establishing relationships with the outside community. Linkages happen mostly through the actions of individual lecturers or through the industrial arm of the university.

At UTHM, the University and Industry Relations Office is a component of the Assistant Vice-Chancellor's University Community Relations Office. It is responsible for the coordination and the strengthening of University-Industry linkages, promoting strategic partnership with the industrial partners to improve teaching, learning, research and development activities in the university. This newly created arrangement is to provide the public face of the university to industry and community and provides the platform for the partnership to work together in a meaningful, systematic and exciting manner.

The other components at the Universities which are the enablers of university (UTHM) and industry collaborations are all our Faculties, the Centres of Excellence, Research, Innovation, Commercialization & Consultancy Office (ORICC), Continuous Education Centre (CEC) and UTHM's Companies.

Certainly there are many potential ways UTHM can work with the private companies. Such collaboration does not limit to research support, cooperative research, knowledge transfer or technology transfer only, it is also in other areas that are within the scope and feasible to the university as an institute of higher learning. These others may include access to human resource, including well-trained graduates and knowledgeable faculty, access to basic and applied research results from which innovative products and processes will evolve, access to professional expertise not usually found in an individual firm, access to university facilities, not available in the company, assistance in continuing education and training, fostering good community relations etc.

University Industry Partnership has been regarded as widely used interactive best practices, a powerful tool for creating congenial environment for technological innovations and enhancing global competitiveness ultimately promoting the interests of the firms and academia across the world. Intense global competition, shorter product life cycle, rising demand for technological innovation unpredictable economic conditions, and escalating cost of research provide firm grounds for the organization to foster collaboration with Universities.

Researchers have proved that University Industry collaboration is instrumental in strengthening the ability of universities to conduct high quality and relevant research and enhancing the capability of industry to compete globally [15]. Collaboration is generally regarded as a vehicle for the realization of

some of these aims and promoting a higher level of competitiveness.

The strength of universities lies in their science and technology base and the strength of industry is technological development. The challenges ahead and the future face by the institutions and organizations have never been greater and both must adapt to rapidly changing circumstances for the benefits of the community.

There is much to learn from bringing together key experts, experienced leaders, the players together in highlighting, disseminating and sharing knowledge on issues which will be significant in building links and bridges the gaps between universities and private industries to work towards a successful, win-win knowledge and economic benefits partnership. Sharing of ideas, practices, and to connect between the different sectors leads to building a thriving model for our regional university industry collaboration.

According to the Typology of U-I Interaction, consultancy is Type II relationship which takes a longer period of time. It usually takes 1 to 3 years which enables deeper communication and better understanding [8]. Training program, seminars, use of laboratories facilities and workshops are Type I relationship. Type I interaction is knowledge transfer activities which are temporary and the understanding is shallow [8]. Prototyping developing and university patent are Type III interaction is focusing on technical cooperation. It usually takes a longer period of time [8]. Table 7 shows that the most predominant type of interaction is consultancy which is 80%. This indicated that the current status of UIC between UTHM and the industry is satisfying as both parties are frequently exchanging knowledge via consultancy. For Type I interaction, the degree of collaboration between UTHM and the industry is at medium, as it falls between 40% to 66.7%. Type II interaction should not be the focus point in the UIC as this relationship is temporary and yield shallow understanding. From the study, Type III relationship is below 17%. These technical cooperation activities for examples development of science parks, incubators, spin-offs and patent licensing are still rare. This implied that the UIC between UTHM and industry is still at infancy stage. Both parties should focus more on Type II and Type III interaction. Overall, use of laboratory facilities, consultancy, seminars and training programmes had accounted about 80% of the current types of UIC.

B. Recommendation

Consulting works complement to academics' research activities [16]. Thus, consulting and contract

research should be carried out whenever possible in conjunction with all forms of industry collaborative works. This is best achieved by providing research-intensive environments that attract research-motivated academicians and quality research output. Basing on Etzkowitz's model [8], UTHM and industry should focus more on Type II and Type III interaction.

C. Conclusion

Finally, this paper has discussed the approaches to UIC from the findings drawn from previous works and the authors' personal knowledge and experiences for stimulating and building collaboration works. UIC stimulates and creates congenial environment for technological innovations, enhancing global national competitiveness by promoting the interests of the firms and academia across the world.

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