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University-Industry Collaboration at a Research University in Malaysia

Woei Yu Lim*, Aslan Amat-Senin, Hock Heng Low, Mohd. Faizal Ramli

Faculty of Management, Universiti Teknologi Malaysia, Skudai, Johor, 81310, Malaysia

Abstract This study investigates the importance of university-industry collaboration (UIC), types of UIC and success criteria of university-industry joint research projects at a research university in Malaysia. Responses of academics from the field of social science and engineering in the research university were compared. Independent Samples Test (t-test) analysis revealed that academics of both fields viewed universities play crucial roles in UIC i.e. university should provide services to industry and society; and generate local economy through research commercialization. The prevalent type of UIC was mainly confined to supervising students' industrial training in the field of social science, while, advising acquaintances in industry scored highly by academics from the field of engineering. Academics of both fields agreed that measurement for UIC success should consist of publication; future research cooperation; improved wealth creation and Intellectual Property (IP) protection. However, they differ in the main success criteria with academics from social science focusing on publication, while, the engineering field proposing wealth creation to university. Finally, future research on UIC's topic is offered.

Keywords University-industry collaboration, Research university, Social science, Engineering

1. Introduction

Past studies indicated that successful university-industry collaboration (UIC) boosts research commercialization, which in turn, increases industrial competitiveness in a country[1],[2], and enables the country to compete at the international level[3]. The topic of UIC has attracted developed countries like Canada and Japan since the past decades[4],[5]. In Malaysia, the practice of UIC is still at its infancy[6].

In fact, owing to the importance of UIC to a country, many studies are focused on this topic. The aspect of UIC which has been investigated includes types and channels of UIC [7-9]; model of UIC[10-12]; determinants of UIC[13-15]; factors motivating UIC[16-18]; advantages of UIC[19],[20]; and outcomes of UIC[21],[22]. However, not all UIC are the same wherein academics from dissimilar field of studies may have different perceptions toward UIC.

As the survey conducted upon several faculties in America by Lee[23], academics' attitudes toward UIC were greatly affected by their studies. In other words, academics from different studies might not have same responses to UIC.

This study focuses on academics from the field of social science and engineering in one of the research universities in Malaysia. It aims to understand and compare their responses related to the relationship between university and industry as well as hopes to propose criteria to measure their successful research projects with industry.

2. Review of Literature on University-Industry Collaboration

The literature reviews first describe the contribution and types of UIC. It was followed by the success criteria for UIC.

2.1. University-Industry Collaboration Contribution

According to Dzulkifli and Ramli[24], UIC in Malaysia should be enhanced and strengthened since UIC aids the economic development in Malaysia.

D'Este and Patel[25] stated that university's third mission must encompasses the services to industry aside from research and teaching. Moreover, universities play an important role in product development and industrial patents [26]. Lee[23] also indicated that universities should have contribution in terms of regional economic development and commercialization of university's research.

2.2. Types of University-Industry Collaboration

Types of UIC generally involve i.) teaching; ii.) training; iii.) research; iv.) consultancy; and v.) technical facilities. Examples activities for the collaboration types are i.) teaching includes involvement of industry in university's

* Corresponding author:
yulim1314@hotmail.com(Woei Yu Lim)
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curriculum and postgraduates' theses; ii.) training includes students' attachment in industry as well as the training exchange between university and industry; iii.) research includes contract research, joint research and research consortium; iv.) consultancy includes university's consulting services to industry; and v.) technical facilities include using university's facilities by industry (or in reverse) as well as industry funding for university's facilities[2],[5],[7],[9],[19], [25],[27],[28].

2.3. Success Criteria for University-Industry Collaboration

Success criteria for UIC should be determined since it can be used as a guideline in facilitating the collaboration. Most of the academics considered publication of article or book as the criteria for successful UIC[29],[30]. D'Este and Patel [25] found that academics are more likely to interact with industries if there is an increase in the research income to the university's departments. Perkmann et al.[31] on the other hand argued that the measurement of UIC should based on direct and indirect outcomes where direct outcomes include patents and publications, whereas, indirect outcomes consist commercial exploitation of results and follow-up opportunities generated from the collaboration.

3. Methodology

In this study, the survey method was adopted for data collection purpose. The survey was focused on academics of a research university in Malaysia where the academics were from the field of social science and engineering. Academics ranging from professors to tutors have been included in this study. The sample size for this study was 94 academics with 39 academics from social science and 55 academics from engineering were randomly selected.

4. Results and Discussion

Research results for importance, types and success criteria of UIC at a research university in Malaysia will be discussed as following.

4.1. Importance of Partnership Relation between University and Industry

T-test results indicated that there is no significant difference on the importance of partnership relation between university and industry for the field of social science and engineering (refer to Table 1). In other words, academics from social science and engineering in the research university have same perception on the roles that should be played by university wherein university should interact with industry through the provision of services to industry and society; generate national wealth through commercialization of research's results and expand university's missions to include interaction with the industry players.

Academics of both fields indicated that the main role of university is to provide services to industry and society besides its tradition role of knowledge advancement.

4.2. Types of University-Industry Collaboration at the Research University

Academics from social science and engineering tend to involve in short-term collaboration with their industry counterparts. For example, majority of academics from social science are supervising students' attachments; interacting with industry through meetings, seminars or conferences and offering short-term services to industry. As for academics from engineering, they are offering advices to acquaintances in company besides supervising students' attachments and attending meetings, seminars or conferences with the present of industry players (refer to Table 2).

In addition to the said collaboration types, a very few number of academics from engineering responded that they are providing long-term services to industry when asking to comment on other types of collaboration in the survey. It is found that not all academics from social science and engineering interact with industry players.

Table 1. Mean Analysis and Comparison of Mean Score on the Importance of Partnership Relation between University and Industry for the Field of Social Science and Engineering by Applying the Method of Independent Samples Test (t-test)

Roles of University	Mean (Social Science)	Mean (Engineering)	F	Sig.	t	Sig. (2-tailed)
University should not only producing the graduates, but to provide services to industry and society	4.38	4.53	0.361	0.550	-0.975	*0.332
Conducting services to industry should be the university's mission other than the field of learning or education and research	3.87	3.98	0.780	0.379	-0.566	*0.573
University should directly involve in generating national wealth through commercialization of research's results aside from producing the graduates	3.82	4.16	0.314	0.576	-1.788	*0.077
Average Mean Scores	4.02	4.22				

Note: * Significant at the 0.05 level

Table 2. Types of Collaboration with Industry for Academics from the Field of Social Science and Engineering in the Research University

Types of Collaboration with Industry	Percentage, % (Social Science)	Percentage, % (Engineering)
Supervise students' industrial training or be the practical training coordinators	61.5	60.0
Attend to meetings, seminars or conferences which also attended by industrial representatives	53.8	58.2
Provide professional training, workshops or short courses to industry	51.3	43.6
Provide informal advices to friends, acquaintances or relatives in industry with the aim to solve their workplace problem	48.7	67.3
Attend to academic's industry training	43.6	43.6
Research and development (R & D) collaboration with industry	41.0	54.5
Collaborate with industrial staffs for students' projects and theses at Bachelor Degree, Master Degree or Doctor of Philosophy (Ph.D.) levels	41.0	38.2
Provide professional consultancy services to industry	33.3	41.8
Using the equipments and facilities in industry, with or without payment	33.3	29.1
Commercialization of research's results	28.2	21.8
Allow industry in using university's equipments and facilities, with or without payment	23.1	32.7
Joint project with industry	20.5	43.6
Never involved in activities that connect to industry	7.7	10.9
Other types of collaboration	0	3.6

4.3. Success Criteria in Measuring Joint Research Projects between the Research University and Industry

Table 3. Mean Analysis and Comparison of Mean Score on the Success Criteria in Measuring Joint Research Projects between the Research University and Industry for the Field of Social Science and Engineering by Applying the Method of Independent Samples Test (t-test)

Success Criteria	Mean (Social Science)	Mean (Engi-neering)	F	Sig.	t	Sig. (2-tailed)
Increase publication of articles, journals and books	4.21	3.91	6.088	0.015	1.547	*0.102
Generate income to individuals or researchers	4.00	3.67	3.563	0.062	1.655	*0.101
Generate income to university	3.92	4.02	0.001	0.970	-0.555	*0.581
Provide opportunities for greater and continuous cooperative research projects with industry	3.90	3.89	0.493	0.485	0.038	*0.970
Result in patent	3.69	3.78	0.074	0.786	-0.438	*0.662
Average Mean Scores	3.94	3.85				

Note: * Significant at the 0.05 level

T-test results indicated that there is no significant difference in all the success criteria tested for the field of social science and engineering (refer to Table 3). That is to say, academics of both fields agreed that publication; wealth creation for individual and university; future research collaboration and patent were the success criteria that should be used to evaluate their joint research projects with industry.

However, academics from social science seems to focus more on individual advancement where academics ranked publication, individual wealth enhancement and finally income generate for university as their first three success criterion. Engineering field on the other hand focuses on university advancement as indicated in their responses where they ranked income generate for university as their primary success criterion, followed by publication as well as future research collaboration as their second and third success criterion.

5. Conclusions

This study reported academics from social science and engineering in the research university reached an agreement that provision services to industry and society; commercialization of research's results and inclusion of services to industry into university's missions are crucial roles for universities. The difference, however, could be seen through the popular types of collaboration wherein most of the academics from social science are supervising students' industrial training; whereas, providing advices to acquaintances in industry for academics from engineering. Furthermore, academics from social science viewed publication as main measurement for successful UIC is different from engineering field where academics perceived profit return to university as significance measurement; even though both of them agreed that other success measurements

should include monetary return to individuals; future collaborative research with industry and patents.

This study includes only the view from university side might limit the research scope, particularly the criteria for successful UIC. Future research should include industries' perspective so as to know their perceptions on the success criteria. Through the mentioned criteria, industries' desired outcomes on UIC could be reflected and by adjusting on both of universities and industries' desired outcomes, the relation between university and industry could be enhanced. The view from private universities should also be considered in future research since they might provide other university's roles in fostering UIC apart from the said roles that have been investigated in this research.

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