

University Industrial Linkages: Relationship Towards Economic Growth and Development in Malaysia

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Abstract—In the globalization context and competitiveness, the role of a university is further enhanced. University is no longer confined to traditional roles. Universities need to interact with others in order to be relevant and progressive. Symbiosis relationships between the university and industry are very significant because the relationship between those two can foster economic development of a nation. In a world of fast changing technology and competition, it is necessary for the university to collaborate with industry to combine efforts fostering the diffusion of knowledge, increasing research and development, patenting innovation and commercializing products. It has become increasingly accepted that the necessity of close university-industry interactions as a mean of national economic prosperity. Therefore, this paper is aim to examine the level of linkages in university-industry interactions to which promotes the regional economic growth and development. This paper will explore the formation of linkages between the Higher Education Institution (University Technology MARA) and industries located in the Klang Valley region of Malaysia. It will present the university-industry linkages with emphasis on the type of linkages existed, the benefits of having such linkages to promote regional economic development and finally the constraints that might impede the linkages and potentials to enhance the linkages towards economic growth and development.

Keywords—Industry, Interaction, Linkages, Regional development, University

I INTRODUCTION

THE status of higher learning institutions is no longer just as an ivory tower. Universities have grown to become a catalyst in growth of a nation when the roles not only confined to human capital development but more importantly university

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is the source for technology transfer, research and development, and innovation. Higher learning institution and industrial linkages significantly have become one of the important agenda of higher education policy-making, as well as in the economic environment of both the national and institutional levels. Within the context of knowledge intensive economies, it is increasingly aware of the importance of higher education institutions as strategic actors in both national and regional economic development, given their potential to upgrade skills and knowledge of the labor force and contribute towards producing and processing innovation through technology transfer [6].

In view of industry, the specific reasons for collaboration with university research centers are considered to be a lack of in-house R&D, shortening product life cycle, cutback in R&D budgets, and changing nature of research priorities [6]. University research centers also want to collaborate with industry as they increasingly need find new ways of generating income as the government intent to reduce R&D fund [6]. It was also discovered that firms enter into university– industry relationships to gain access to students as potential future employees and to aid on product development [6], [12].

It has become increasingly accepted that in economic and science policy to use universities and public research organizations as nucleus and source of economic development. The earliest scholars such as [23], [13], [19], and later [10], [21], [22], and [16] [18] pointed out the necessity of close university-industry interactions as a mean of national economic prosperity. This paper is aim to examine the level of linkages in university-industry interactions to which promotes the regional economic growth and development. This paper will explore the formation of relationships and linkages between the Higher Education Institution (University Technology MARA) and industries located in the Klang Valley region of Malaysia. It will present the university-industry embeddedness linkages with emphasis on the type of linkages existed between those two, the benefits of having such linkages to promote regional economic development and finally the constraints that might impede the linkages and potentials to enhance the linkages towards economic growth and development.

II .UNIVERSITY – INDUSTRY RELATIONSHIPS

Universities have emerged as central actors in the knowledge-based economy [4]. No longer confined to their traditional roles of teaching and conducting primary research, the famously successful examples of Stanford University and the growth of Silicon Valley, indicate that they are

increasingly viewed as key drivers of innovation and “major agents of economic growth [4]”. Universities do not only generate new knowledge through primary research, they also provide technical support and specialized expertise and facilities for on-going firm-based R&D activities [6]; [3]. University activity is not confined to the process of knowledge transfer on a local basis, but also acts as a conduit of new knowledge through the “global pipelines” of international academic research networks [2]; [11]; [14]. From the economic perspectives, most scholars agreed that the role of a university can be viewed from its significant impacts in generating localization economies. Those impacts from the university as the center of knowledge creation and the enhancement of exiting knowledge generate categorically from the direct, indirect and induced impact.

Universities with the greatest local economic impacts are generally those with the highest quality research programmes [8]. The most compelling reason for technology-based firms to locate near universities is to facilitate tacit knowledge transfer from faculty who are on the leading edge of scientific breakthroughs [8]. The role of the universities is significantly important in creating the wealth of a nation, through the practices of research and scholarship. Universities are foremostly education institutions and without any doubt the production of highly educated graduates is by far the largest contribution universities make to the creation, transfer and dissemination of knowledge [20]. Student placements in the form of internships, co-op education, or student research projects on company problems as part of project paper or final examination are some the examples [20]. The transfer is not a one-directional handing over of theoretical knowledge and its application to a practical problem, but a two way exchange and multiple site/multiple mode learning process [20]. In the era of globalization and digital technology propelled by the advancement of information and communication technology, the university and industrial linkages are widening with much broader range of knowledge creation, dissemination and utilization.

The reasons for universities to seek cooperation with industry appear to be relatively simple. Peters and Fuschfeld [15] have identified several reasons for this interaction: (1) industry provides a new source of money for university; (2) industrial money involves less “red tape” than government money; (3) industrially sponsored research provides student with exposure to real world research problems; (4) industrially sponsored research provides university researchers a chance to work on an intellectually challenging research programs; (5) some government funds are available for applied research, based upon a joint effort between the university and industry [15]. On the other hand, several main reasons, which are claimed to motivate the industry to increase university industry cooperation, have been provided also by Atlan and Peter and Fuschfeld [1] and [15]. They are: (1) access to manpower, including well-trained graduates and knowledgeable faculty; (2) access to basic and applied research results from which new products and processes will evolve; (3) solutions to specific problems or professional expertise, not usually found in an individual firm; (4) access to university facilities, not

available in the company;(5) assistance in continuing education and training; (6) obtaining prestige or enhancing the company’s image; and (7) being good local citizens or fostering good community relations. [1] and [15]

The relationship of the university and industry can go beyond the service supplier oriented. Technology transfer is the key aspect of industry and university interaction. According to Van Dierdonck and Debackere [5], interaction between industry representatives and university faculty follows a predictable sequence [24]. Initially, faculty members serve as consultants and assist with data analysis [24]. At the next stage, industry may choose to license innovations developed by university personnel [24]. Spin-off companies based on these innovations generally follow and as the university becomes more involved in technology transfer, the establishment of a science park and an incubator for new technology-based start-up companies is considered by university administrators and the university board of directors or trustees [24]. The establishment of such entities reflects a university's commitment to the region's economy and finally step in the technology transfer sequence is the establishment of a venture capital fund, attached to, or managed by the university [24]. University and industrial linkages should take collective and consensus manner in order to bring changes and promoting growth and development of an area.

III UNIVERSITY TECHNOLOGY MARA – INDUSTRY LINKAGES

In this study, the university chosen was University Technology MARA located in the most developed metropolitan region of Klang Valley in Malaysia. University Technology MARA is one of the oldest university in Malaysia established in 1956 which was known before as Institute Technology MARA. The university has grown to be the largest university producing graduates and employed by firms and industries in various fields. As the nation is growing for industrialized and developed nation and high income economy, the government recognizes the unique and special benefits that collaboration between the university and industry can have. If the nation is to develop as an innovation-led economy then it is important to look at the concept of collaboration and the commitment to it as a joint venture project that adds increasing value. It is a three-way process of partnership, i.e. government, business and academia and fulfillment of a collaborative venture that will bring benefits [9]. The world is becoming more technologically complex and therefore the forms of partnership outlined in the strategy have become an ever more urgent requirement. There is no doubt that there is a vast storehouse of knowledge and skills and probably even more potential in universities and industries. Academicians need to understand the needs of the industry and industry needs to tap the expertise from the academic community. Enhancing university-industry linkages is a corner stone of economic development; hence the university has established the office of Industry and Community Network in 2007. This office acts as a catalyst towards engaging with the industry to address the needs in new knowledge as well as the creation of applicable and economically useful knowledge for

the well being of the society given the university's role as the economic and intellectual's engine for the nation. The strong partnership with the industry will open up opportunity for the academia to get the experience and the exposure in order to be relevant in line with the current needs in the market [9].

The office of Industry and Community Network (ICN) has established Academic- Industry and Community Division (AIC) and Graduate Employability Division (GEm) with the objective to strengthen the current and existing partnership between industry and university in the area of academia-industry and graduate employability [9]. The major role of AIC division is to form strategic partnerships with industry and community in order to gain mutual benefits for all parties through: (1) Academia: by encouraging academicians to go for attachment in gaining up-to-date and relevant knowledge from the industry/community. Experience obtained can be incorporated into their teaching, learning, research and consultancy activities; (2) Industry: by offering resources such as expertise, equipments and facilities to enhance business economic activities; (3) Community: by empowering community with knowledge and services to help improved quality of life and societal well being. With regard to this, academicians initiatives in community engagement would steadily propagate University Social Responsibility (USR) [9]. Another division of Industry and Community Network is the Malaysian Academy of SME & Entrepreneurship Development also known as MASMED. The objectives of MASMED are to develop and instill entrepreneurship values among the graduates and academicians in order to increase graduate employability and employer-ability, to produce entrepreneurial graduates and to generate income for the university. Another entity of ICN is the UiTM Holding, the business arm of the university to facilitate all business-related activities of the university [9]. With a strong set up of ICN, the successful linkages between the university and industry are to bring myriad of benefits to the academicians, the students, and industries and most of all to the nation at large. The study undertaken takes University Technology MARA as the university to have an affiliation with the industries within the Klang Valley region (see Fig.1). With the establishment of Industrial and community networking in UiTM, the university commitment towards the outside world does not only confine to knowledge transfer. As shown in Table I, in 2009 the university has interacted with various industries. A total of 200

industries have interacted with the university in Klang Valley region spatially concentrated in the area of Kuala Lumpur, Shah Alam and Petaling Jaya. Services type of industries dominated the linkages with 41%, followed by others which include government institutions, telecommunication, mass media, etc., and third construction industries with 15.5%. The linkages have increased within three years with 326 industries have a relationship with the university. By 2011 (see Table II), industries that interact with the university has increased by more than 60 percent within a short period of time. Services industries contributed the highest linkages, followed by information technology industry and manufacturing with concentration in Kuala Lumpur, Shah Alam and Petaling Jaya (see Fig.1). The linkages have been concentrating in these three areas due to its strategic location in Klang Valley metropolitan region. Kuala Lumpur, Shah Alam and Petaling Jaya located along a major highway and these are the main

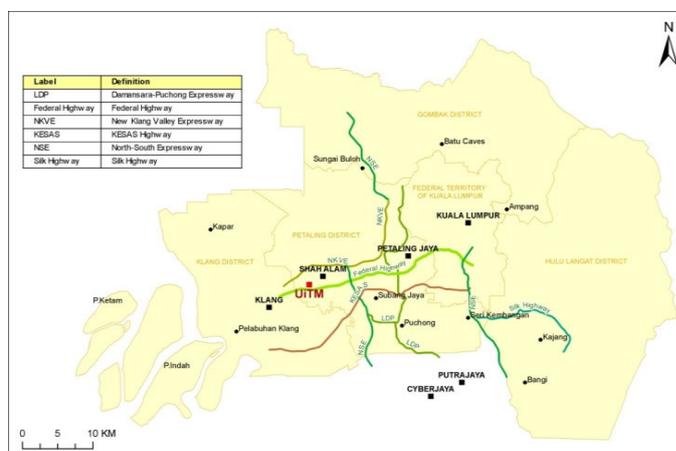


Fig.1 Location Map of UiTM Within Klang Valley Region

growth centres for Klang Valley which caters for various economic activities. The university and these three areas are connected linearly with a main transportation network which allows for easy mobility and accessibility for a greater university-industry interaction in a most developed region of Klang Valley.

TABLE I
PERCENTAGE OF INDUSTRIAL TYPES AND LINKAGES WITH UiTM ACCORDING TO AREA IN 2009

Area	Types of Industry						Total
	1	2	3	4	5	6	
Shah Alam	3.5	1.0	7.5	4.5	1.5	4.0	22.0
Kuala Lumpur	2.5	2.5	21.5	4.5	2.5	9.5	43.0
Petaling Jaya	2.0	0.0	6.5	2.5	0.5	2.0	13.5
B.B. Bangi	0.5	0.0	0.0	0.5	0.5	0.5	2.0
Kajang	0.0	0.0	1.0	0.5	0.0	0.5	2.0
Putrajaya	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Batu Caves	0.0	0.0	0.5	0.0	0.0	1.0	1.5
Puchong	0.5	0.0	0.5	0.0	0.5	0.5	2.0
Seri Kembangan	0.5	0.0	0.0	0.5	0.5	0.5	2.0
Subang Jaya	0.5	0.0	1.5	1.5	0.5	0.5	4.5
Klang	0.5	0.5	1.0	0.5	0.0	1.0	3.5
Sungai Buloh	0.0	0.0	0.0	0.0	0.5	0.5	1.0
Ampang	0.0	0.5	1.0	0.5	0.5	0.0	2.5
Total	11	4.5	41	15.5	7.5	21.0	100

Note: 1= Manufacturing, 2= Trading, 3= Services, 4= Construction, 5=IT, 6=Others

TABLE II
PERCENTAGE OF INDUSTRIAL TYPES AND LINKAGES WITH UiTM ACCORDING TO AREA IN 2011

Area	Types of Industry													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Kuala Lumpur	2.5	3.4	0.9	11.0	1.5	4.3	0.3	4.9	0.6	1.5	1.2	1.5	3.1	36.8
Shah Alam	4.6	1.8	0.3	5.5	4.6	0.0	2.5	2.5	0.9	0.3	0.0	0.6	0.6	24.2
Petaling Jaya	0.9	2.1	0.9	2.1	1.2	0.6	0.9	1.8	0.3	0.6	0.0	0.6	0.3	12.6
Bangi	0.6	0.0	0.0	0.6	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.3	2.1
Kajang	0	0	0	0	0	0	0	0.3	0.0	0.3	0.0	0.3	0.3	1.2
Batu Caves	0.6	0.0	0	1.5	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0	3.1
Puchong	0	0.9	0.3	0.0	0.3	0.0	0.0	0.9	0.0	0.3	0.0	0.0	0.0	2.8
Seri Kembangan	0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Subang Jaya	0.3	0.0	1.2	0.9	0.6	0.0	0.3	0.9	0.3	0.3	0.0	0.0	0.0	4.9
Klang	2.1	0.6	0.6	1.5	0.6	0.6	0.3	0.3	0.3	0.3	0.0	0.6	0.3	8.3
Sungai Buloh	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.9
Ampang	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.9
Cyberjaya	0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.3	0.0	0.0	0.3	1.5
Total	12.0	9.2	4.6	23.9	9.5	5.8	4.3	13.2	2.5	4.0	1.2	4.6	5.2	100.0

Note: 1= Manufacturing, 2= Construction, 3= Trading, 4= Services, 5= Engineering, 6= Finance, 7= Food, 8= IT, 9= Transport & Logistic, 10= Education, 11=Insurance, 12= Medical, 13= others

Industrial types are also diversifying to include industry such as finance, education, insurance, food and medical. As the university realized the role they can contribute to the economic growth and development, they are continuously increased their networking with various industries.

IV. THE SURVEY

The significant of the university and industry relationship was further approach using the questionnaire survey techniques. The questionnaire survey to industries located in the Klang Valley region was conducted based on the framework of UiTM affiliation with the industries. A total of 200 questionnaires were distributed to firms and industries in the study area within the Klang Valley region. A total of 83 questionnaires were returned for analysis. The data gathered were analysed quantitatively using Statistical Package for Social Science (SPSS) software.

V. RESULT AND DISCUSSION

Out of 200 questionnaires distributed, slightly more than 40% have responded to this survey. The result of the analysis is discussed under several points:

- type of linkages existed between the university and industry
- benefits of having such linkages to promote regional economic development
- constraints and potentials in enhancing the linkages

To articulate the types of linkages existed between the university and industry, respondents from the industries were asked to indicate their interaction. From the listing of various possible linkages, the highest percentages appear to be a university student internship with 53% (Fig. 2). Even though there were 19% who did not respond, 81% indicated they have interaction with the academia in terms of staff industrial training, interaction by attending a conference and seminar as well as engaging academia in projects, consultancy and joint research. Other linkages such as use and licensing of university held patents, use of incubator and laboratory facilities of university, exchange of information and knowledge and engagement in science parks have not been embedded in the relationship of both the university and industry.

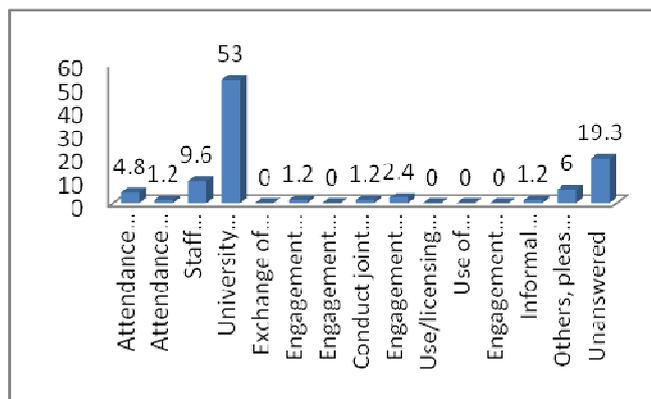


Fig. 2 Types of Linkages with the University

To investigate further how the industries can enhance their roles in the region's economic development, the industries have also realized the importance of engaging research and development with the university. Sixty nine percent agreed that both university and industry should have strong linkages in research and development activities (Fig. 3).

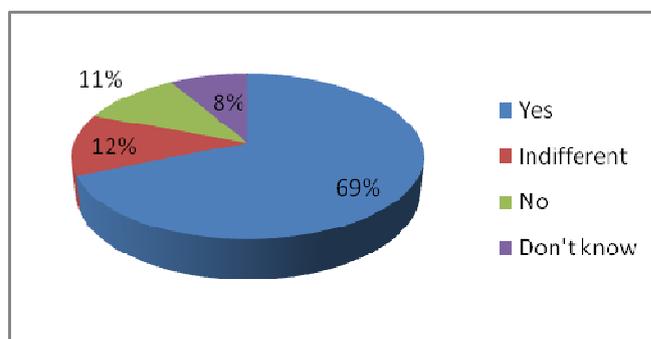


Fig. 3 Opinion of Industries in Research and Development Activities

R&D activities carried out in universities play an important role in driving firm-level innovations R&D activities. This would create greater collaboration for advancement of technology and innovation for economic growth. Through R & D activities industries able to increase their productions when trickle effects of R&D can generate more revenue which in return fruitful to the development of a region.

To further elucidate the benefits of industrial linkages, the firms attached to the university have been asked question on how they perceived the interaction to be useful and beneficial. Table III, indicates the mean scores of how industry could benefit to the university industrial linkages. All industries do agree that the usefulness of linkages is to recruit high quality graduates with the total mean score of 4.2 and continuing education of staff (mean score of 4.0). University as a centre of wisdom and knowledge disseminator is the source to produce skilled graduates to support continuous human capital for economic development. Staffs from the university can benefit from a strong relationship in many ways such as

TABLE III
PERCEPTION ON THE BENEFITS OF UNIVERSITY
INDUSTRY LINKAGES

Criteria	Mean Score						Overall
	Manufacturing	Trading	Services	Construction	IT	Others	
Obtain access to new ideas and know-how	3.8	4.0	3.7	3.7	3.6	3.7	3.7
New product development	3.8	4.0	3.6	3.7	3.8	3.7	3.7
Product improvement	3.8	4.0	3.7	3.5	4.0	3.8	3.7
Quality improvement	3.5	3.3	3.8	3.6	3.0	3.8	3.7
Solving technical problems	3.0	4.0	3.5	3.6	3.2	3.6	3.5
Recruit high quality graduates	3.8	4.0	4.2	4.3	4.0	4.1	4.2
Reduce in-house R & D cost	2.5	3.0	3.0	3.1	2.8	3.2	3.1
Continuing education of staff	4.0	4.3	4.1	4.1	3.8	4.0	4.0

Note:

Scale Rating: 1 - Not useful at all, 2- Not useful, 3- Somewhat useful, 4- Useful , 5- Very useful

staffs industrial training, contract research and advisory panel. Industry can also benefits from having good linkages for product improvement (mean score of 3.7) when they can obtain access to new ideas and know-how (mean score of 3.7). Generally, all industries perceived that university industrial linkages can benefit the industry when the mean scores skewed to the scale of useful interaction except reducing in-house R & D costs which is skewed to somewhat useful. R & D facilities normally are located at the university which perhaps is much more suitable rather than located in the industry premises.

When discussing on the constraints of university industry linkages, the main constraints the industries perceived to have that limits their collaborations were time, manpower, financial and communications. Based on Table IV, overall, level of constraints in the university industry linkages were at a moderate level skewed to scale of little extent. On the other hand, for trading companies, they were having constraints at a great extent on time, manpower, and financial to have a good linkages with the university. For firms of information technology, the level of constraints was at a low level with little extent to not at all in terms of financial, time and manpower. The same pattern also exists for construction and services firms. Therefore, it can be concluded that industries were not entirely having a very significant constraints to have a strong linkages with the university.

TABLE IV
CONSTRAINTS ON UNIVERSITY INDUSTRY LINKAGES

Industrial Types	Mean Score			Communication
	Time	Manpower	Financial	
Manufacturing	3.50	3.50	2.00	2.75
Trading	4.00	4.00	4.00	3.00
Service	2.78	2.66	2.44	2.50
Construction	2.73	2.80	2.73	3.07
Information Technology	2.40	2.40	1.40	3.40
Others	3.33	3.25	2.96	3.46
Total	2.99	2.93	2.61	2.96

Scale Rating:

1 – Not at all, 2- Little extent, 3- Somewhat, 4- Great Extent
5- Very Great Extent

Even though, in the earlier discussion, the types of linkages that the industries involved were very limited, those industries surveyed see the potentials of relationship with the university. As shown in Table V, to enhance the relationship of both industry and university, joint organize meetings, talks and communication received the highest mean score (3.92) to be on the slightly effective ways to collaborate, followed by industrial internship in the academic curriculum (3.89), encourage industrial visits by students (3.86) and encourage industrial representative in university committee (3.71). From the perspectives of various industries, there were mixed opinion on the suggestions of potentials of relationship. For example setting up industrial parks closer to universities, received tax concessions collaborating with university, and establish a mechanism to link universities with industries

TABLE V
POTENTIALS OF UNIVERSITY INDUSTRY LINKAGES

Suggestions	Mean Score						Overall
	1	2	3	4	5	6	
Include industrial internship in the curricula	4.0	4.7	3.9	3.8	2.8	4.1	3.9
Encourage industrial visits by students	3.8	4.7	3.8	3.7	4.0	4.0	3.9
Encourage regular industrial visits by academics	3.3	4.3	3.2	3.5	1.8	3.8	3.4
Improve laboratory facilities and other infrastructure at universities	3.8	3.7	3.3	3.8	2.0	3.5	3.4
Involve staff from industry in teaching programmes	3.0	3.7	3.5	3.5	2.2	3.8	3.5
Setup a mechanism to link universities with industries	2.8	4.3	3.2	3.5	2.4	3.5	3.3
Publicize university activities relevant to industry	3.8	4.3	3.5	3.7	2.6	4.0	3.7
Jointly (university and industry) organize informal meetings, talks, communications	3.8	4.3	3.8	3.7	3.8	4.2	3.9
Government tax concessions for companies collaborating with universities	2.5	4.0	3.0	3.3	1.8	3.2	3.1
Setup industrial parks closer to universities	3.3	3.0	3.2	3.5	2.8	3.4	3.3
Encourage academic representative in industrial committees/chambers/boards	4.0	3.7	3.5	3.7	3.2	3.8	3.6
Encourage industry representative in university committees	4.0	3.7	3.5	3.8	4.0	3.8	3.7

Note:

1= Manufacturing, 2= Trading, 3= Services, 4= Construction, 5= IT, 6= Others

Scale Rating :1 – Not at all 2 – Effective 3 –Somewhat Effective 4 – Slightly Effective 5 – Very Effective

received lower mean rank which might indicates that the industries have not really foresee how they can participate when the setup of those companies are under small and medium enterprise. Somehow, in order for the linkages to materialize, the work of the university can be publicize to industries and the academicians can play their roles by being a representative in industrial committees, chambers and board of organizations.

The results from the above analysis do not draw a conclusive university industrial linkages in terms of regional economic growth and development. The type of linkages most industries interact is the student's internship that would lead to employability and human capital development. The direct impact of this relationship thus produce graduates, skill level workforce and new firm formation. Eventhough, the industries agreed on R & D activities, but within the industries 72% do not have an R &D unit in their firms. This situation does not hamper other possible direct collaborations such as joint venture R & D, representative in industry's committees and vice versa, continuous engagement in staff and student training. However, the university (UiTM) has set a strong platform to embark on solid linkages with emphasis on academia and industry to collaborate in four strategic thrusts of engage, realign, implementation and growth and sustainability. With this, the interation with industriesspecifically focus on industrial PhD, business matching, network taskforce, knowledge transfer programme, staff attachment, contract research and consultancy , and others that include endowment fund / scholarship / donation [9]. The university under industry and community network can put more efforts to enhance collaborations that would bring significant changes to the region's economic development.

VI CONCLUSION

This study has looked into university industry linkages at a surface level. There is a need to further explore the many angles of the university and indusrty linkages especially in Malaysia. As Malaysia is going for the objective of high income economy, the university and industry must go hand in hand to meet the challenges of raising the innovative and creative capacity of human capital for the knowledge-based economy and enhancing the scientific and technological infrastructure to meet the needs of a competitive economy. The role of universities in local economic development goes far beyond the linear transfer of basic research into commercialization products [4]. Instead, universities emerge as multifaceted economic entities that are embedded in regions, and not only produce codified and commodified knowledge and human capital, but also actively participate as important institutional actors in both building and sustaining local networks and flows of knowledge, and in linking them with global ones [4]. There are many ways to boost scientific innovation locally, and universities can play its role tremendously. The same would be for the industries. When linkages are significant, industry should be able to directly promote local economic development by providing skill and productive human resources to generate competitive advantages who make use of the innovations from the university. The competitiveness of cities region is better when the linkages between the university and the local industries are cohesive. Finally, this paper has provided preliminary perspectives on the dynamics of the university and industry interaction when a university not only develops academic excellence in various disciplines but also sets an explicit priority to develop strong linkages with industry for the

purposes of regional and national economic development by establishing a formal networking system so as to become a catalyst for further enhancement of multifaceted role in promoting economic development.

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ACKNOWLEDGEMENT

The authors acknowledge the financial support provided by the Development and Facility Unit Department and Research Management Institute of University Technology MARA in Selangor, Malaysia for this research.

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