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EXPLORING THE POSSIBILITY OF CO-OPERATION BETWEEN HIGHER EDUCATION AND INDUSTRIES IN MALAYSIA

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Abstract

This case study attempts to explore the posibility of co-operation between Higher Education and Industries in Malaysia. It highlights on the need, importance and the problems faced by both the entities in co-operation and collaboration. Qualitative approach was used in this study. The interviews are semi-structured and are used to generate data from university deans, collage principals, company managers and chief executive officers (CEO). The issues of suitability and reliability as well as the process of sampling, administration and analysis of the instrument of data collection are discussed. In the course of the analysis and discussion, it compares the respective contribution made by the Universities and the Industries in the field of Research and Development (R&D). Moreover, it provides suggestions to improve linkages for joint-ventures and concludes that the Universities and Industries must play complementary roles for mutual benefits in terms of knowledge dissemination and innovation. It also presents the views of the different researchers on the subject and considers the merits of the various types of co-operation suggested for the universities to keep pace with the global trend in upgrading their courses in Science and Technology.

Keyword: Co-operation, Higher Education, Industries

Academic Discipline

Social Science

Sub-Discipline

Education

Subject Classification

Educational Change

Type

Survey/Interview

1.0 INTRODUCTION

This project paper which attempts to explore the possibility of co-operation between higher education and industries. Higher education refers to institutions of higher learning such as colleges, polytechnics, private and public universities. 'Industries' refers to organizations involved in the production of goods and services, for example, manufacturing, petroleum, telecommunications etc. The focus of this project paper is co-operation between higher education and Industries.

Accordingly, this paper aims to discover the framework of university and industry collaboration and the effect of such a collaboration. Universities act as an important driver of economic development and catching-up through their role in education and technology absorption, adaptation, and diffusion (Yusof, 2006). Beyond the teaching-research-entrepreneural taxonomy, some authors have advocated for shifting the focus toward creating developmental universities which collaborate with external agents (including firms) nor necessarily with a focus on commercialization and profit-making but rather with the broader purpose of contributing to social and economic development (Brundenuis, Lundvall, and Sutz, 2009).

Traditional university system was built for the purpose of disseminating knowledge which later on evolved to have a dual mission of dissemination of knowledge and production of new knowledge through research (Morphew, 2003), (Atkinson & Blanpied, 2008) and (Cheng, 2011). Recently universities have again expanded to embrace 'third mission' (Wong, Ho & Singh, 2011). As laid down by (Etzkowitz, 2002) that is university involvement in regional economic development through capitalization of knowledge produced at the university. However, commercialization of university research is a risky investment and required big funding for developmental stages since university research outcomes are normally at the embryonic stage and not a ready marketable product (Yusuf, 2008). Thus universities need to secure funding in order to cope with the high cost of research and development while industries are also in need of university linkages in order to keep abreast of new technological development to maintain competitive measures with their rival (Yusuf, 2006). Therefore, university and industry collaboration is seen as a strategic approach that can benefit both parties to achieve their mission.

University and industry collaboration can be defined as 'bi-directional linkages between university and industry entities,

established to enable diffusion of creativity, ideas, skills and people with the aim of creating mutual value over time' (Plewa et.al., 2013). Although university and industry collaboration is seen as a strategic approach to achieve university mission in enterpreneural activities and industry mission to appear as champion in new era of rapid technology development, still this cross-sector collaboration is difficult to manage because of different culture and mission held by both.

Globalization is a term frequently used in the world today, but its precise meaning is not always clear. Globalization and internalization are sometimes interchangeably used so that differences between them are not constantly defined. In higher education, there are dizzying variety of definitions of both worlds. Higher education in Malaysia is delivered through both public and private systems under the jurisdiction of the Ministry of Education. In this paper, higher education system refers to the system that incorporates post-secondary education., namely colleges and universities. The bulk of the higher education carried out by the country's public institutions but the private education sector also complements the effort of the government by offering the opportunity to pursue higher education at a more affordable fees than is available elsewhere.

Higher education in Malaysia began with the formation of University Malaya in 1959. To date, twenty public universities have been established in Malaysia to cater for the increasing needs of business and industry (MOE, 2015). However, the public institutions cannot cater for the increasing demand for higher education in the country. The private colleges began to emerge in Malaysia in early 1980's but started to mushroom only when the Private Higher Educational Institutional Act (PHEIA) was enforced in 1996, allowing the private sector to enter the higher education market. There are now about 600 private higher learning institutions including private universities in Malaysia that complement the work of public institutions in providing higher education.

The most recent development amongst private colleges in the last decade was the introduction of twinning programmes where a local college enters into an arrangement with a foreign university and provides the first stage of degree course in this country, while the final part is taken at the university concerned overseas. Apart from public universities, and private universities and colleges, polytechnics were also established by the government in 1969 to provide training in engineering and commerce to students specializing in technical and vocational areas.

2.0 BACKGROUND OF THE STUDY

Universities-industry cooperation refers to the interaction between any parts of the higher educational system and industry aiming mainly to encourage knowledge and technology exchange (Bekkers and Bodas Freitas, 2008, Siegel et al., 2003). University- industry cooperation have had a long history (Bower, 1993, Oliver, 2004), as one means of building organizations' knowledge stock (Cricelli and Grimaldi, 2010). Of late, there has been a substantial increase in these collaborations in several nations including the United States (e.g. Lehrer et al., 2009), Japan (e.g. Woolgar, 2007), Singapore (e.g. Lee and Win, 2004), and European Union Countries (e.g. Barrett et al., 2000, Gertner et al., 2011, Powers, 2003). This increase has been attributed to a combination of pressures on both industry and universities (Giuliani and Arza, 2009, Meyer-Krahmer and Schmoch, 1998). For industry, pressures have included rapid technological change, shorter product life cycles and intense global competition that have radically transformed the current competitive environment for most firms (Bettis and Hitt, 1995, Wright et al., 2008).

With regards to universities, pressures have included the growth in new knowledge and the challenge of rising costs and funding problems, which have exerted enormous resource burdens on universities to seek relationships with firms to enable them to remain at the leading edge in all subject areas (Hagen, 2002). In addition, there is a mounting societal pressure on universities for them to be seen as engines for economic growth and less as fulfilling the broader social remit (i.e. education and generating knowledge) they have had in the past (Blumenthal, 2003, Philbin, 2008). These pressures on both parties have led to an increasing stimulus for developing university-industry cooperation that aims to enhance innovation and economic competitiveness at institutional levels (e.g. countries and sectors) through knowledge exchange between academic and commercial domains (Perkmann et al., 2013). Moreover, university-industry cooperation has been widely perceived as a promising tool for enhancing organizational capacity in open innovation – where an organization employs external networks in developing innovation and knowledge (Dess and Shaw, 2001), as a complementary option to traditional internal R&D (Harvey and Tether, 2003).

Different authors have expressed different views on the subject of University-Industry collaboration with special emphasis on R&D (Research and Development). However, they all agree on the importance of R&D in upgrading skills which will contribute to promoting productivity and hence economic growth. Collaboration between universities and industries is critical for skills development (education and training), the generation, and adoption of knowledge (innovation and technology transfer), and the promotion of entrepreneurship (start-ups and spin-offs). The benefits of university-industry linkages are wide-reaching: they can help coordinate R&D agendas and avoid duplications, stimulate additional private R&D investment (additionality effect), and exploit synergies and complementarities of scientific and technological capabilities. University-industry collaboration can also expand the relevance of research carried out in public institutions, foster the commercialization of public R&D outcomes, and increase the mobility of labor between public and private sectors. The benefits of university-industry collaboration are also evident in developing countries, including Malaysia (Marotta, Blom and Thorn, 2007)

University and industry collaboration takes multiple forms. (Lind, Styhre & Aaboen, 2013) laid down four types of university and industry collaboration.First form is where the industry provides research funding for the university and takes no part in decision making of the research direction. Second form of collaboration is where the industry is more involved in the research collaboration, for example by taking part as a member of the board of research. However, industry does not involve in day-to-day work of the project. Third form of collaboration is also known as 'contract research' where industry dictates the direction of the research for a specific research area and thus university researchers have little freedom in the

final say of the research direction. This form of collaboration is normally in favour of industry and university researchers who usually find themselves restricted by confidential information to publish their findings in their journals or conference. While the fourth form is where parties, university and industry decide on the direction of the research, which is relevant for both parties and will benefit both parties in the end.

Research on university-industry collaboration activities can be investigated from both the university and the industry perspectives. Industrial linkages are seen as a source of knowledge and catalyst for the R&D development in universities especially for the purpose of commercialization (Chandran et.al, 2009). Research on innovation widely recognises the prominent role of collaboration in accelerating the success of knowledge transfer and commercialization between research organizations and industries (Acs et.al, 1994; Hagedoorn et al., 2000; Svieby and Simaons, 2002; Cohen et al., 2002; Meyer-Krahmer and Schmoch 1998; Arundel and Geuna, 2004). In a similar issue, Poyago-Theotoky et al., 2002; brooks, 1994; and Sigel et al, 2002, have documented the benefits of collaboration well. Collaboration benefits universities in terms of revenue, lisencing, equity, sponsored research, donations and technology development. Undeniably, the high value of private gifts, grants and contracts are found to be important mechanisms in technology transfer (Rogers et al., 2000).

On the other hand, by examining the source of the total productivity growth in licencing activities, Thursby and Thursby (2000) indicated that an increase in business reliance on external R&D increases the licencing among universities. Similarly, numerous studies highlighted the importance of university knowledge creation for the industrial technology upgrading. Indeed, the role of universities is further highlighted in the context of national innovation systems (Freeman, 1987; Lundvall, 1992; Nelson, 1993) and within the triple helix framework (Leydesdorff and Etzkowitz, 1996, Etzkowitz and Leydesdorff, 1999) where interactive networks between universities, industries and government are seen as a complimentary source of technology development in particular for the industry and universities. Despite the mixed evidence on the likely contribution of universities, at large, scholars in the developed countries argue on the positive contribution of universities to the development of industrial research and innovation (Salter and Martin, 2001); Beise and Stahl, 1999). Nevertheless, some scholars find that not all channels of university knowledge contribute to the innovation performance of the industry (Bekkersa and Freitas, 2008).

Higher education institutions are more concerned with research because of the specialized academic staff in various fields of study. The industries, on the other hand, provide opportunities for practical training. There is sharing of knowledge between the two partners. In the light of knowledge transfer, one has to take a look at the current state of higher education and economic performance in Malaysia. According to Geiger (1986), private higher education institutions in the mass private sectors are heavily dependent on tuition fees, demand-absorbing, and market-oriented. They usually offer a few study programmes, vocationally oriented, in high demand study fields, with mostly part-time academic staff and low tuition fees. The state plays a decisive role in the emergence and existence of such a mess of private sectors; the state does not provide any subsidies for private colleges and universities. On the other hand, public universities are funded by the government and provided with full-time academic staff. This type of a situation cannot be considered as very promising towards R&D. There is room for development of skills.

According to Datuk Seri Mustapa Mohamed (2016), the International Trade and Industry Minister, our productivity grew by only 3.3% last year compared to the 11th Malaysia Plan target of 3.7% per annum. In 2016, the productivity is estimated to grow at an even slower pace of between 2.5% and 3.5%. Based on the Economic Report 2015/2016, the projection for growth in 2016 takes into account concerns over the severity of growth slowdown in emerging markets, particularly China. Other downside risks include declining commodity prices, rising volatility in financial markets and weakening ringgit leading to higher prices.

Against the backdrop of increased uncertainty in the economy, the government has made budgetary cuts in some sectors including education, especially in scholarship fund. This shortfall has to be made up by the private sector. For example, the industries but then, the areas of cooperation between higher education and industries must be identified. To quote Datuk Seri Wee Ka Siong (2016), Minister in the Prime Minister's Department, "Institutions of higher learning need to actively collaborate with the industry in their research activities that would lead to commercialization of viable ideas. We must develop entrepreneurial graduates who are imbued with the will power to be job creators and not merely job seekers".

3.0 PROBLEM STATEMENT

Although higher education-Industries collaboration is ideal in theory, there are many problems to be faced and solved before such a collaboration can be successful. In some cases, universities and industries do not see eye to eye. The following will elaborate on the issue.

Collaboration between cross-sectoral institutions is difficult to manage because of different culture, background and mission posed by each party to the collaboration. As for university-industry collaboration, Bruneel et al. (2010) has classified two types of barriers such as problems related to different motivation. Different orientation of university and industry posed as the main barrier towards successful collaboration. Industry often conflicts with university researchers over direction of research and time for research outcome disclosure. University researchers are always keen to disclose their research findings either through journal publication or conference where as the industrial personnel are more likely to keep the research findings as secret to avoid their rivals from gaining the information (Brinns & Driscoll, 1998). Besides that, the inexperience of technology transfer office personnel also presented as one of the factors against successful collaboration (Lai, 2011)

Second problem is related to conflict over intellectual property ownership and dealing with university administration. The rise of university in the capitalization of knowledge has given motivation to the university to capture formal intellectual property. Adoption of government policy such as Bayh Dole Act of the United States that allows university to retain ownership of intellectual property resulting from research funded by the public funding has also increased university interest in intellectual property ownership. Through ownership, university has an exclusive right to exploit the research finding. However, this is also the goal of industry that is to own intellectual property from research funded. Conflict over ownership of IP will certainly collapse university-industry collaboration.

4.0 LITERATURE REVIEW

According to Ladislav (1985), the following are some of the problems and barriers facing cooperation between universities and industry.

i. Differences and sometimes even conflicts in the aims and values of universities and those in the industry become a problem. Here though, perhaps, difficulties are not so much related to a disparity in ultimate objectives (those of a public service with purely academic interests as opposed to those of profit or 'profitable investment') as to their practical consequences. For example, industry variability has to maintain strict respect for relatively short deadlines, whereas work in higher education (whether research or teaching) is suited to a longer-term approach.

ii. Lack of flexibility in university structures is another fundamental difference between the two worlds. Whereas in industry everything has to be organized with a view to solving problems rooted in a broad range of varied but interconnected areas, higher education is largely organized around disciplines between which there is often (though not always) little communication.

iii. Universities are more often than not subject to cumbersome legislative and administrative machinery, a feature which is criticized with greater frequency than any other by people from industry and explains their preference for informal arrangements. Here, there is a special dread of what is seen as slowness of decision-making in higher education.

iv. Linked to the foregoing problem is the question of the status of university teachers and researchers. For university staff in some countries, rules relating to secondment or extramural (professional) activities can more or less preclude any kid of major long-term collaboration with industry. By contrast, there are very few, if any, similar barriers affecting the participation of industrial specialists in university teaching.

v. The industrial sector - and in particular the small and medium-size firms, sometimes has an inadequate grasp of the nature of university work and the restriction and norms to which it is necessarily subject. Often underestimated, for example, is the time needed satisfactorily to conclude a research project or a given course of training, as well as the real cost of both. Many people from industry are frequently only interested in rapid answers or solutions which universities are unable to provide, while others are automatically wary of 'external' proposals, particularly on the part of universities which are commonly considered (though perhaps unfairly) to adopt an over-theoretical approach to problems.

vi. There are differences in outlook and conventional conduct between the industrial and university worlds with regard to the extent to which results of research should be made available; whereas discretion or even outright secrecy is the rule of the industry, academics are under constant pressure to publish their work for the widest readership possible. While this particular barrier to cooperation is nearly always cited as significant, especially in the United States, it may be less so in at least some parts of Europe., since there is plenty of evidence to suggest that mutually satisfactory arrangements are often possible. Moreover, much the same applies to the problem of patent rights, which may arise from the following joint university-industry projects.

While among the developing countries, another barrier that posed against successful university-industry collaboration is the attitude of the industry which tends to depend on technology transfer from developed countries rather than developing local technologies through local expertise. For instance, in Malaysia, collaboration between uiniversity and industry is still to be seen in its applicability since Malaysian scenario tends to depend heavily on technology adopted from abroad. Rather than taking effort to develop its own research and development project (Cheng, 2011). According to (Shapira et al., 2006) knowledge generation in Malaysia is generally low and this is proven from the Analysis of Malaysian Knowledge Content Survey, 2003. It is also a fact that only about 3.4% of Malaysian research output was commercialized during the Eight Malaysia Plan (Cheng, 2011). Many studies have also pointed out that Malaysian manufacturing firms are 'good adopters and adapters of technology rather than innovators' (Shapira et al., 2006). However, according to (Cheng, 2011) recent development in Malaysia has shown that university collaboration is flourishing, motivated by success demonstrated by universities in developed countries like the USA and Japan.

5.0 RESEARCH OBJECTIVES

The objectives of the study are to:

1. Identify the types of cooperation that can be promoted to achieve successful collaboration between universities and industry.
2. Identify the importance for universities and industry to collaborate in research and development (R&D).

3. Identify the likely problems and barriers that might be encountered in achieving effective cooperation (R&D) between universities and industry.

6.0 RESEARCH QUESTIONS

The research questions are as follows:

1. What types of cooperation can be promoted to achieve successful collaboration?
2. Why is it important for universities and industry to collaborate in research and development (R&D)?
3. What problems and barriers are likely to be encountered in achieving effective cooperation (R&D) between university and industry?

7.0 RESEARCH DESIGN

Research has been described as a systematic investigation (Burns, 1997) or inquiry wherby data are collected, analyzed and interpreted in some way in an effort to "understand, describe, predict or control an educational or psychological phenomenon or to empower individuals in such contexts" (Mertens, 2005). This research has utilized a qualitative design methodology. According to Draper (2004), qualitative approach can be described as a naturalistic and interpretive approach to understand social phenomena in their social settings to produce 'thick description'. Denzin and Lincoln (1994) point out that qualitative research is "multi-method in focus, involving an interpretive, naturalistic approach to its subject matter".

A qualitative approach was undertaken to analyze data for this study. Bogdan and Biklen (1998) define qualitative data analysis as "working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others". Data analysis can be seen as a process through which a researcher searches and arranges the interview themselves, field notes, and other materials gradually (Bogdan & biklen, 1998).

Bogdan and Biklen (2003) used the "qualitative research" as the superordinate concept, joining different research approaches with certain common characteristics as well. With the expression "qualitative research", the research is denoted as consisting of the basic empirical material, collected in the research process, which is verbally described or narrated. Furthermore, the collected material is worked on and analyzed in words without numerical operations (Mesec, 1998).

In other authors, (e.g. Denzin & Lincoln, 2000; Creswell 1998) similar definitions of qualitative research are found. According to Creswell, qualitative research is the research process designed according to a clear methodological tradition of research, whereby researchers build up a complex, holistic framework by analyzing narratives and observations, conducting the research work in the habitat (Creswell, 1998). Fraenkel and Wallen (2006) draw attention to the fact that qualitative researchers mainly focus on the examination of characteristic traits or properties of a certain activity, group, situation, or materials, respectively, but they are not much interested in the frequency of appearance of this activity, group, situation, or material.

Qualitative research is an exploratory approach emphasizing words rather than quantification in gathering and analyzing the data. It is a matter of the inductive, constructivist and interpretative exploratory approach with the following main stresses: to view the world with the eyes of the examinees, to describe and take into account the context, to emphasize the process and not only the final results, to be flexible and develop the concepts and theories as outcomes of the research process (Bryman, 2004). To summarize, for qualitative research, it is characteristic that data are gathered more in a verbal and visual than in a numeric form. When analyzing the gathered data, statistical procedures are also not used, but instead predominantly qualitative analysis, the essence of which is searching for codes in the analyzed materials (Bryman, 2004).

The main part of the qualitative analysis of the material is formed by the coding process, i.e. interpreting the analyzed text and attributing the meaning (of key words, notions, codes) to its individual parts (Charmaz, 2006; Bryman, 2004; Flick, 1998), respectively. Qualitative analysis of the material starts with defining the coding units, followed by the appropriate phenomena records according to our judgment and analyzing the characteristics of these phenomena, and ends with the development of the grounded theory (Glaser & Strauss, 1967). Qualitative research is carried out in line with the principles of the interpretative paradigm, i.e. the focus is on examining the subjective experiences of an individual and on recognizing the importance which the individual attaches to specific events, whereby not even the subjective views of the researcher of the studied situation are neglected (Janesick, 1998).

The aim of qualitative research is to lead to active integrated and detailed cognition of phenomena, preferably in natural and concrete circumstances, for the researcher is interested in the context of the pursued activities. As part of the environment, not only is the researcher able to understand what the person is conveying in the form of a rational message and standardized speech, but also the indirect implications of this speech with a specific syntax, contextual lapses, hidden meanings and speech breaks are perceived. Wishes, expectations, interests, needs and personal opinions of the people included into the research should help the researchers to better comprehend the examined phenomena. In this context, the researcher should be aware of the fact that with their participation - and with the researched situation itself – they are influencing the events they are observing, and the discursive reality, as their research object (Flick, 1998; Denzin & Lincoln, 2005).

7.1 Case study

Case study research was the framework utilized to conduct this study. Case study is defined as an exploration of a "bounded system." Case study research takes place over time through detailed, in-depth data collection involving multiple sources. Context of case study research involves situating the case in its original setting. Cronbach has stated that "all social scientists are emerged in case studies" in that, individuals take account from context and relevant forces inside and outside the unit being studied (Cronbach,

1982). Case study can build a theory, include purposeful sampling, and include both quantitative and qualitative data. Case study, as a part of descriptive research, is conducted when seeking answers and explanations, when it is not feasible to manipulate behavior, and variables are not easily identified.

The purpose of this type of research is to characterize something as it is, there is no manipulation of treatments, and the researcher "takes things as they are" (McMillan & Schumacher, 1984). Case study research seeks holistic description and explanation in an attempt to arrive at a comprehensive understanding of the group under study. Case study focuses on a particular event or situation making the case itself important for what it reveals about the event and what it may represent. Case study is referred to as descriptive because the end product is a rich, "thick" description of the event under study and also relies on an interpretation of meanings of the descriptive data in terms of "norms, community values and deep seated attitudes and notions" (Guba & Lincoln, 1989).

Case study research may be appropriate when trying to eliminate erroneous conclusions, so that one is left with the most compelling interpretation of the data. When it is necessary to convey a holistic, dynamic and rich account of a program, case study research is the best approach. One would select case study research design due to the nature of the research questions. Case study offers a positive, successful avenue for investigating complex settings with great potential for understanding of the phenomenon (Merriam, 1988). It is the best avenue for answering questions. Case study plays a valuable role in advancing the research knowledge base. Due to many of its strengths, case study is a successful and popular design for study in the field of education.

7.1.1 Advantages of case study

There are some advantages in using a case study as a qualitative research approach. First, a case study may offer larger details about a particular phenomenon. For instance, it may include narrative and a specific description about a particular activity, personal relationship or a group interpretation.

Second, as mentioned by Stake and Trumbull (1982 as cited in Stake, 2005) the readers of a case study may obtain *naturalistic generalizations* from personal or *vicarious experience.* In other words, people can share and understand others' social experience. The third strength is that a case study provides a holistic interpretation and always refers to a social context. Additionally, it does not involve any treatments, experiments or manipulated social settings. Consequently, the data will be considered as natural phenomena in people's real lives. Finally, I think a case study will probably not spend much budget as other methods such as experiments and surveys do, but it depends on the type and the period of the research.

7.2 Population of the study

The setting of the study was institutions of higher education and industries. The purpose was to obtain the perspectives of the educators (deans) and the chief executive officers (CEO) of companies in Malaysia on the subject of cooperation between higher education and industries. A total of ten respondents - three from universities, two from colleges and another five from the companies were selected for the interview.

The ten respondents are coded R1 to R10 respectively. Respondents R1 to R5 are from higher education and R6 to R10 are from the industry. From among the population of the study, five educational institutions were included from the cities of Kuala Lumpur and Johor Bahru. The five companies were selected from the cities of Malacca and Penang.

R1, Dean of University X from Kuala Lumpur has fifteen years of experience in heading the Faculty of science. R2, Dean of the Faculty of Engineering from university Y has about twelve years of experience and R3, Dean of the Faculty of Arts from university Z has about ten years' experience. The other two respondents R4 and R5, are the principals of private colleges with ten years of administrative experience. The two colleges are conducting courses in Business studies. Out of the five companies selected, three are based in Kuala Lumpur and the other two are from Johor Bahru. R6 is a manager of an Oil and Gas company, R7 is a manager of a pharmaceutical company, R8 is an automobile company manager, R9 is a telecommunication company CEO and R10 is a textile company manager. All the above companies are located in Malacca and Penang and all the executives have several years of managerial experience.

8.0 RESEARCH METHOD

Research method used in this study is interviews. The interviews are semi-structured and are used to generate data from university deans, college principles, company managers and chief executive officers (CEO). The issues of suitability and reliability as well as the process of sampling, administration and analysis of the instrument of data collection is discussed in the following section.

8.1 Interviews

Interviews are a systematic way of talking and listening to people and is another way to collect data from individuals through conversations. The researcher or the interviewer often uses open questions. Data is collected from the interviewee. The researcher needs to remember the interviewer's views about the topic is not of importance. The interviewee or respondent is the primary data for the study. Interviewing is a way to collect data as well as to gain knowledge from individuals. Kvale (1996) regarded interviews as " … an interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production, and emphasizes the social situatedness of research data."

Interviews are ways for participants to get involved and talk about their views. In addition, the interviewees are able to discuss their perception and interpretation in regards to a given situation. It is their expression from their point of view. Cohen, Manion and Morrison (2000) explain " … the interview is not simply concerned with collecting data about life: it is part of life itself, its human embeddedness is inescapable." The researcher has to know and select the appropriate method for addressing the needs of the research question. Then, the researcher has to make a decision and choose the right method for that study. Data collection has its complexities and demands.

It is the role of the researcher to ask questions. The questions ought to elicit valid response from respondents. Hoyle, Harris and Judd (2002) comment that questions have " … dual goals of motivating the respondent to give full and precise replies while avoiding biases stemming from social desirability, conformity, or other constructs of disinterest."

Interviewers that have been properly trained, and play the proper role of the interviewers along with well-designed questions can conduct a good interview. Hoyle, Harris and Judd (2002) agree "… proper training and proper interviewer behavior can help greatly in achieving the goals." There are many reasons to use interviews for collecting data and using it as a research instrument. Gray (2004) has given the following reasons:

- There is a need to attain highly personalized data.
- There are opportunities required for probing.
- A good return rate is important.
- Respondents are not fluent in the native language of the country, or where they have difficulties with written language.

8.1.1 Semi-structured Interviews

On the other hand, semi-structured interviews are non-standardized and are frequently used in qualitative analysis. The interviewer does not do the research to test a specific hypothesis (David, & Sutton, 2004). The researcher has a list of key themes, issues, and questions to be covered. In this type of interview, the order of the questions can be changed depending on the direction of the interview. An interview guide is also used, but additional questions can be asked. Corbetta (2003) explains semi-structured interviews as follows:

> "The order in which the various topics are dealt with and the wording of the questions are left to the interviewer's discretion. Within each topic, the interviewer is free to conduct the conversation as he thinks fit, to ask the questions he deems appropriate in the words he considers best, to give explanation and ask for clarification if the answer is not clear, to prompt the respondent to elucidate further if necessary, and to establish his own style of conversation".

Additional questions can be asked and some may be questions that have not been anticipated in the beginning of the interview. Note taking or tape recording documents the interview. This type of interview gives the researcher opportunities to probe for views and opinions of the interviewee. Probing is a way for the interviewer to explore new paths which were not initially considered (Gray, 2004). Having " … key themes and sub-questions in advance lies in giving the researcher a sense of order from which to draw questions from unplanned encounters" (David, & Sutton, 2004).

The researcher conducting semi-structured interviews is freer one than conducting a structured interview (Kajornboon, 2004) in which the interviewer does not have to adhere to a detailed interview guide. Patton (2002) recommends to " … explore, probe, and ask questions that will elucidate and illuminate that particular subject … to build a conversation within a particular subject area, to word questions spontaneously, and to establish a conversational style but with the focus on a particular subject that has been predetermined."

The strengths of semi-structured interviews are that the researcher can prompt and probe deeper into the given situation. For example, the interviewer inquires about using computers in English language teaching. Some respondents are more computer literate than others are. Hence, with this type of interview, the interviewers are able to probe or ask more detailed questions of respondents' situations and not adhere only to the interview guide. In addition, the researcher can explain or rephrase the questions if respondents are unclear about the questions.

In this study, semi-structured face-to-face interviews were used to collect qualitative data from the institution heads for the first phase of the research. This tool has been deemed suitable, being in keeping with the interpretive philosophy of the study as 'unstructured or semi-structured interviews are often used by interpretive researchers and assume greater diversity in both the design and the use of research instrument and in the nature of responses from participants (Bush, 2007) and in interviewing people, we can 'find out what is in somebody else's mind' especially through qualitative interviewing, a framework is created for participants to share their views as they best see fit (Ribbins, 2007). He mentions

four aspects to be managed effectively to produce 'rich and reliable data' from interviews. These are:

- What is asked and how
- The interviewer and interviewing
- Recording
- Transcribing

In keeping with these four key elements, the first task was to plan and finalize the interview schedule. In the planning process firstly, all the objectives of the interviews were clarified that the interviews were intended to explore the possibilities of cooperation between higher education (university) and industry. The interview questions were designed with the guiding principle to put these questions which enable interviewees to tell "what is in (or on) their minds and avoid those that put things there" (Cohen et al., 2007).

The drawbacks are inexperienced interviewers who may not be able to ask prompt questions. If this is the case, some relevant data may not be gathered. In addition, inexperienced interviewers may not probe into a situation. For example, if the respondents do not know how to use computers and do not want to use them in language teaching, the interviewer needs to probe and find out the reasons and ask for explanations.

9.0 PROCEDURE

The researcher (interviewer) contacted the selected respondents over the phone, obtained their consent, and made arrangements for the interviews. The first two respondents, representing their groups, universities and industries respectively, were interviewed, face-to-face at their own places. However, the rest were interviewed over the phone. All of them were cooperative and were frank in expressing their views on condition that their identities should not be revealed. The criteria used in the selection were academic qualification, work experience and efficiency.

10.0 ANALYSIS

The interviewer conducted the interviews with the respondents (R2) and (R6) face-to-face and over the phone with the rest of the respondents. The analysis is based on the responses produced by the respondents involved in the research project.

10.1 Types of cooperation for collaboration

Three of the respondents from the university stated that cooperation can be promoted through joint research projects whereas the other two stated that specific goal-oriented research contracts awarded by the industry to universities can help cooperation.

Two respondents from the industries suggested that general industrial grants to universities for purposes such as the setting up of a chair can improve cooperation. Another two respondents from the industries added that work placement of students and the reduced-price sale of equipment by industry to universities can also contribute towards partnership between the two. However, one respondent felt that lecturers and researchers could act as industrial consultants.

10.2 The importance of research and development (R&D)

Two respondents from the universities stated that universities are the source of knowledge and they have the experts and the equipment to conduct research. Another three of them agreed that our universities have to keep pace with the global trend, upgrade their courses in science and technology and thus enable our graduates to develop their skills to conduct research.

Two respondents from the industries said that the results of the research can be transferred to the industries. Another two respondents from the industries added that the companies concerned can put the theory into practice and generate income for their stakeholders. The final respondent supported their view that R&D plays an important role in upgrading technology and it is the driving force behind innovation.

10.3 Barriers to closer links

Two respondents from the higher education said that financial resources are beyond their means and this acts as a barrier to joint-venture with the industries. Another two of them added they are academically oriented and take more time to complete research programmes. One of the higher education respondents expressed his view that institutions of higher education are more interested in disseminating knowledge.

However, two respondents from the industries stated that they are unwilling to stake on experiments whose results are not conclusive. Another two of them said that they are commercially oriented and would like to complete projects within a shorter period to save cost. Another respondent agreed with the view that the new findings should enable them to market their products faster and beat their rivals.

10.4 Difficulties in finding employment

Two respondents from higher education stated that their graduates are choosey in accepting jobs offered. They complained that salaries are not commensurate with their qualifications. Another two of them felt that the graduates did not choose the appropriate course to suit their interest when they entered higher education institutions. One more of the

respondents from the university and three respondents from the industries complained that the fresh graduates lack basic skills and experience in performing their tasks. They also expressed their dissatisfaction that the graduates do not stick to their current jobs for any length of time; rather, they prefer to job-hop due to better benefits. This attitude does not help them to develop their research skills.

The remaining two respondents expressed a neutral view. They stated that there is an imbalance between their skills possessed by the graduates and the needs of the industries. Higher education has academic orientation and the industries commercial orientation. An oversupply of graduates leads to some unemployment. However, they reiterated, demand for labor fluctuates over time and during recession, there is bound to be some unemployment.

10.5 Government policy regarding university-industry collaboration

Two respondents from higher education said that Malaysian government is supportive and makes allocation for R&D in its annual budget. It is aware that the university produces human capital through training of scientists, engineers and researchers. Two respondents from the industry complemented the former's view by adding the industries make use of the new knowledge resulting from the researches to innovate their production process.

Three respondents from higher education agreed that the government provides grants to universities and research institutes involved in R&D programmes. Even during times of economic slow-down, it does not make any budgetary cuts for R&D. However, three more of the respondents from industries felt that the government should increase its allocation for R&D in view of its importance in promoting economic growth. They also argued that budget allocation alone would not be sufficient to promote unversity-industy collaboration. They suggested that the Ministry of Higher Education and the Ministry of Trade and Industry must hold joint-meetings, discuss the issues and coordinate efforts to cooperate in areas of common interest such as purchase of equipment and training of research personnel.

10.6 Distance factor

One of the respondents from higher education considered distance as an important factor in improving relationship between higher education and industries (companies) in conducting research programmes. He pointed out that the nearer the partner institution, the better the relationship will be between the two. Two more of them and one researcher from the industry said close proximity enables easier access and convenient work-placements for university researchers. They explained that those involved in research programmes can travel to their respective places faster, thus saving time and expenses.

Two of the respondents from higher education and two from the industries agreed that the researchers and the trainees will feel more comfortable because of the familiar environment. However, the remaining two researchers from the industries differed in their opinion. They contradicted the views of the other respondents by saying that distance is psychological in effect and not a real problem. Nowadays, there are different models of communication and are relatively cheaper. Moreover, students posted to companies, near or far away, must adapt themselves to their new surrounding. So, they believe that distance cannot become a disadvantage.

10.7 Funding for R&D

Two respondents from higher education and two more from the industries shared the view that financial resources must come from the government and the business community. Another two respondents from the higher education said that universities and colleges are confronting rising costs, declining enrollments and less tax support while the fifth respondent from the same group regretted that the financial constraint is affecting the R&D programmes.

However, three respondents from the industries explained the problems faced by them in collaborating with the higher education. First of all, their companies will do the cost-benefit analysis. Only when they are convinced that the research results will benefit their business, will they support their partner institution of higher education financially. Secondly, when productivity declines, competitive edge in the international market level is lost and this situation leads to reduced profits. Consequently, companies are forced to reduce their allocation for R&D. Thirdly, they added that differences of opinion arise between the two partners as to the direction of research especially in the time-frame for completing the research programmes i.e. Higher education tends to drag on wheareas the companies want a speedy completion. However, all the three of them agreed that the business community should provide more funds for joint-research between higher education and industries.

10.8 Meetings between universities and industries

Two respondents from higher education and two respondents from the industries were unanimous in expressing their opinion that meetings are important for exchanging views and that universities are a source of knowledge and the CEOs are the 'captains' of industry. Meetings provide them with the opportunity to discuss.

One more respondent from the higher education and another from the industry supported their view by saying that R&D is a joint-venture. So, they have to meet, discuss and decide on the direction of research and also the requirements.

One of the respondents from the industry cautioned that both partners must have mutual respect, trust and understanding. He gave an example where the companies want to keep the research results as secret whereas the universities want to publish the results to foster their image in the academic world.

The fifth respondent from the industry complained that the CEOs do not attend meetings regularly and they do not have

constructive ideas to contribute towards the research programme due to their lack of technical knowledge. The remaining two of the respondents from higher education advised that the joint-meetings between the two partners must be attended by well-qualified, experienced and responsible representatives from both sides.

10.9 The importance of innovation

Two respondents from higher education said that innovation is important in the education field to compete with their counter-parts at the national and international levels. One more of them supported their views by saying that higher education has to keep pace with the rapid development of new technologies, especially in the electronics and information technology. So, new courses have to be designed and the old ones upgraded.

Two respondents from the industry expressed their dissatisfaction that Malaysia has lagged behind in the industrial development due to poor R&D. He added that R&D provides the key to innovation and countries like the USA and Japan have forged ahead of us in this field. To this, two respondents from higher education responded by saying that the fault lies with the education policy. Its orientation should be towards science and technology. So, student intake for science and technology courses should be increased. Innovation leads to product improvement and hence its marketability.

The remaining two of the respondents from higher education agreed that to catch up with the developed nations, Malaysian higher education institutions and the industrial sector have to collaborate in R&D and they have to share the cost and benefits. Moreover, the government and the business community must support the R&D programmes financially. Collaboration in innovation activities helps technology transfer.

10.10 Suggestions to improve collaboration

One respondent from higher education and another from the industry agreed that frequent communication will help develop understanding of each other's mission and vision. They also suggested that there must be provisions to allow knowledge exchange between researchers within industry and university.

Two of the respondents from the industry proposed that university possesses competence in the area of research and added that only high profile academic researchers handle the research. They explained that this measure will help to make the research one of high quality.

Another respondent from the industry suggested that the respondents from the higher education attend industry sponsored meetings, conferences and seminar to ensure active participation. This measure will promote mutual respect, trust and confidence. To this point of view, one respondent from higher education responded by saying that the industry must encourage their research personnel to attend life-long learning courses and specialized customized programmes offered by the higher education.

One respondent from the industry and another respondent from the higher education shared the view that there must be formal joint research agreements involving research undertaken. This will help to avoid any misunderstanding. Moreover, they suggested that the cost of research be shared since financial resources are limited.

Two respondents from the higher education suggested that as the universities are a source of knowledge, changes in technology be identified and reported among member industries through publications. This will assist the companies to maintain competitive advantage at the national and international levels.

11.0 FINDINGS

Below are the findings of the study based on the interview with the respondents from the university and the industry. It also answers the research questions 1 (RQ 1), research question 2 (RQ 2) and research question 3 (RQ 3).

11.1 RQ 1: Types of cooperation for collaboration

Cooperation can be promoted through joint research projects, specific goal-oriented research contracts awarded by industry to universities, general industrial grants to universities for purposes such as the setting up of a chair or the provision of facilities for general research activity.

Work placements of students and the reduced-price sale of equipment by industry to universities can also contribute towards the partnership between the two entities. University lecturers and researchers can act as industrial consultants. Circumstances have also compelled the institutions of higher education and the industries to collaborate. This is supported by Hagen (2002), who stated that "pressures have included the growth in new knowledge and the challenge of rising costs and funding problems, which exerted enormous resource burdens on universities to seek relationships with firms to enable them to remain at the leading edge in all subject areas.

University and industry collaboration takes multiple forms. This is supported by Lind, Styhre and Aaboen (2013). They have laid down four types of university and industry collaboration. First form is where the industry provides research funding for the university and takes part in decision making. Second form of collaboration is where the industry is more involved in research collaboration, for example by taking part as a member of the board of research. Third form of collaboration is also known as "contract research" where industry dictates the direction of the research for a specific research area and thus university researchers have little freedom in the final say of the research direction. This form of collaboration is normally in favour of industry and university researchers usually find themselves restricted by confidential information to publish their findings in their conference. While the fourth form is where parties, university and industry

decide on the direction of the research, which is relevant for both parties and will benefit both parties in the end. As can be seen from the above findings, the views expressed by the respondents are in agreement with the opinions of Hagen (2002) and Lind, Styhre and Aaboen (2013).

11.2 RQ 2: The importance of university-industry collaboration in R&D

Universities are a source of knowledge. They have the experts and the equipment to conduct research. The research results can be transferred to the industries. The industries or the companies can put the theory into practice. The industries as the engines of economic growth generate income for the stakeholders. So, this is a win-win situation.

However, R&D is an on-going process. Our universities have to keep pace with the global trend. They have to upgrade their course in science and technology so that our graduates can develop their technical skills to conduct research. R&D is the driving force behind innovation. In recognition of this idea, the Malaysian government, according to Rasiah and Govindaraju (2009), implemented explicit policies since the early 1990's to stimulate university-industry R&D linkages. Following the action plan for industry technology development (APITD) of 1990, the government launched the Malaysian Technology Development Corporation (MTDC) to support university-industry R&D linkages.

Moreover, university-industry coorporation has been widely perceived as a promising tool for enhancing organizational capacity in open innovation-where an organization employs external networks in developing innovation and knowledge (Dess and Shaw, 2001) as a complementary option to traditional R&D (Harvey and Tether, 2003). Although different authors have expressed different views on the subject of university-industry collaboration, all of them are unanimous on the importance of R&D in upgrading skills which will contribute to promoting productivity and hence economic growth. Collaboration between universities and industries is critical for skill development (education and taining), the generation and adoption of knowledge (innovation and technology transfer) and the promotion of entrepreneurship (start-ups and spinoffs).

The benefits of university-industry linkages are wide-reaching: they can help coordinate R&D agendas and avoid duplications, stimulate additional private R&D investment and exploit synergies and complementarities of scientific and technological capabilities. University-industry collaboration can also expand the relevance of research carried out in public institutions, foster the commercialization of public R&D outcomes, and increase the mobility of labour between public and private sectors. The benefits of university-industry collaboration are also evident in developing countries, including Malaysia (Marotta, Blom and Thorn, 2007).

11.3 RQ 3: Problems encountered in achieving effective cooperation between university and industry R&D

Financial resources are one of the problems or rather barriers in university-industry cooperation in R&D. Universities have limited financial resources. The problem arises when the industries want to confirm that the research results benefit their business. So, they are cautious in contributing funds towards joint-ventures.

The next problem is one of approach where universities are academically oriented whereas the industries are commercially oriented. The former wants to disseminate knowledge through publications while the latter wants to maintain secrecy. Furthermore, it is the time-frame. Universities would like to take a longer time to complete the research programmes while the industries want a speedy completion of the projects. The universities prioritize quality and the industries want to save cost.

There is a mismatch between the needs of business and industry and the types of graduates the universities produce. The industries complain that our graduates lack the technical skills and the universies say that the graduates chose the wrong courses or choosey in accepting jobs. The views of the respondents are supported by the following authors. According to Brinns and Driscoll (1998),, different orientation of university and industry posed as the main barrier towards successful collaboration. Industry often conflicts with university researchers over direction of research outcome disclosure. University researchers are always keen to disclose their research findings either through publication or conference whereas the industry personnel are more likely to keep the research findings as secret to avoid their rivals from gaining the information.

To quote Lai (2011), the inexperience of technology transfer office personnel also presented as one of the factors against successful collaboration. In the words of Ladislav (1985), differences and sometimes even conflicts exist in the aims and values of universities. Here though, perhaps, difficulties are not so much related to a disparity in ultimate objectives (those of a pubic service with purely academic interests) as opposed to those of profit or 'profitable investment' as to their practical consequences. For example, industry viability has to maintain strict respect for relative short deadlines, whereas work in higher education (whether research or teaching) is suited to a longer-term approach.

12.0 Conclusion

It is recommended that the university and the industry try to understand the importance of cooperation between them because the main concern is students. The university's mission is to provide high quality education to the students. The industry has to provide practical training. Thus, the cooperation from the industry is vital. This will enable the students to get the real exposure of the working environment. A successful university-industry partnership can help to produce knowledgeable and skilled workers who can contribute towards economic development in Malaysia. Such a cooperation can lead to a win-win situation. Universities disseminate knowledge and the industries conduct R&D. Universities should become more innovative and the industries' operations more profitable due to higher productivity. Skilled workers are an asset to the nation.

However, the partners have to protect their interests, too. The universities have to improve their international rankings to earn the confidence of the public, especially the parents of the potential students. On the other hand, the companies in the corporate sector have to show profits to the stakeholders. The universities have the facilities for research and the results of the research are used by the industries to improve their production and consequently their income. So, it is a case of mutual benefit. While the science and technology and education policies extensively target universities to promote linkages, fewer incentives are available for the industries to establish R&D collaboration. Most of the efforts for collaboration are partly undertaken by the universities and not by the industries. A policy drive to correct the mismatch in terms of a perceived importance of the university as a source of knowledge is needed. Specifically, the policy should first encourage the active role of industries in R&D activities so that university knowledge can be utilized to improve their innovation.

The technology-push strategies are less effective. Nonetheless, industries are in a position to absorb the new knowledge created by the universities. Likewise, universities should also improve on the issues of R&D management and consequently participate actively in fostering linkages. At the very least, at the beginning of the economic development stage, universities through their centres of excellence should consider complementing R&D.

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