

# 11 The Challenges Arising in the Evolution of the Triple Helix Institutional System

## The Case of Malaysia

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### INTRODUCTION AND BACKGROUND OF STUDY

Malaysia's first formal science and technology policy was introduced in 1986 (National Science and Technology Policy II 2000–2010 [NST-PII] 2000). One of the major programs of this policy was the provision of greater opportunities for interactions between industry and public research institutions. Its aim was to increase economic development at a national level in tandem with support for Malaysia's industrialization program. Since its inception, the government has been proactive in seeking industry collaboration and cooperating in enhancing several economic and industrialization programs. For instance, a greater focus on research and development (R&D) projects that involve industry has been reflective of this new policy implementation (NSTPII 2000). The policy was originally formulated by the Malaysian National Scientific and Research Council, membership of which consists of both government and industry representatives (NSTPII 2000).

Due to macro environmental changes, namely developments in the economic, political and socio-cultural landscapes, the policies of the Malaysian government on innovation have subsequently evolved and developed. This change is perceived to be more flexible in meeting the needs of all key stakeholders in national industry growth, especially the three key tripartite partners: the government, industry and university research bodies. In fact, one of the main objectives of the Eighth Malaysia Plan (2001) was to encourage the introduction of the network form of collaboration between universities, government and industries (Eighth Malaysia Plan 2001). One of the government's responses to these needs was to start encouraging more R&D collaboration between government agencies, universities and private sector industrial bodies. This reaction by the government was supported by the view that more active participation by industry in R&D collaboration (with the government and academia) would improve the state's innovation and economic growth

agenda for an increasingly turbulent and unpredictable global marketplace (Dodgson 2000; Martin and Scott 2000).

Indeed, this led to recognition of the role that universities could play in shaping and enhancing existing government and industry policies and programs (Abd Razak and Saad 2007). Malaysian universities have since been actively encouraged to participate more in R&D activities and to be entrepreneurial through knowledge transfer partnerships, for example, between industry and government bodies. In fact, some of the local public universities have set up, or are in the process of setting up, commercial arms of their own (namely, private holding companies). This idea of the 'entrepreneurial university', as stated by Etzkowitz and Leydesdorff (1997, 1999) and later reiterated by Leydesdorff (2000), is a unique feature of the triple helix model as a dynamic process and evolutionary model for enhancing innovation. The Malaysian government has also awarded research university status to four top national universities designated under the Ninth Malaysia Plan, to be the country's first full-fledged research universities (Abd Razak and Saad 2007).<sup>1</sup>

This study, which examines the challenges arising in the evolution of the triple helix institutional system in the context of the Malaysian socio-economic environment, comprises four key sections. The first section provides an overview of the existing literature on the triple helix model. The second discusses the evolutionary process followed by the triple helix system in general and more specifically in Malaysia. The third section investigates the issues and challenges facing Malaysian institutions in the course of their evolution as key actors within the implementation of the triple helix model. A fourth and final section concludes with a brief note on the way forward for the development of the triple helix system in Malaysia and other developing countries.

## KEY FEATURES OF THE TRIPLE HELIX MODEL

Etzkowitz and Leydesdorff (1997, 1) first described the triple helix model as a spiral model of innovation able to capture multiple reciprocal linkages at different stages of the capitalization of knowledge. Etzkowitz and Leydesdorff (1997) argued that the triple helix model will be the key strategy of the national or multinational innovation agenda in the twenty-first century. The model is presented as the only feasible solution for intranational cooperation between the key drivers for national economic growth. This view was later echoed by Godin and Gingras (2000), who, using the success of the Canadian model, suggested that in the past two decades the Canadian government had profusely focused on the need to develop, promote and indeed integrate ties between universities and businesses in conjunction with national level policy. However, according to Saad (2004), the triple helix model is generally viewed as lacking strong

theoretical and empirical bases. For example, Saad (2004) and Saad and Zawdie (2005) have questioned the very relevance of the role played by institutions within the triple helix system in knowledge generation and subsequently in the growth of national and regional innovation. Furthermore, they point to various key issues and challenges relating to successful implementation of innovation strategies based on the triple helix model in developing countries.

The dynamic nature of the triple helix model allows a flexibility and integrative function which becomes embedded in the interfaces of the interlocking helical relationships. For example, industry gains some of the values derived from universities through a sharing of research knowledge. This further encourages research links and collaboration between private firms and universities in order to deliver goods or services to the general public and society, thereby attaining mutual, common, long-term strategic goals of socio-economic growth (Etzkowitz and Leydesdorff 1997). Industries also develop an academic dimension and begin to appreciate the value of research, sharing and disseminating knowledge within their own cultures through, for instance, the provision of higher skill and knowledge levels. In addition to performing their traditional functions, the stakeholders of the triple helix also engage in enhancing the roles of the other spheres by practicing values derived from the helical partners (Etzkowitz and Leydesdorff 2001). This conjoint dynamic behavioural process model also means the long-term objectives become synergistic to each other and complement the partners. This partner coordination and cooperation is considered central to the success of the triple helix model.

Another main argument for the triple helix model is the emphasis on the importance of academia in the capitalization of knowledge. According to Etzkowitz and Leydesdorff (1997), in the existing dynamic macro environment, universities are changing their mission, establishing new relationships with industry and becoming more entrepreneurial. Etzkowitz et al. (2000, 326) define this new type of university as the 'amalgam of teaching and research, applied and basic, entrepreneurial and scholastic interests'. However, to fulfil this new role, universities are expected to obtain some business skills to effectively carry out activities, such as commercializing their research, setting up their own start-ups and having a concrete business plan (Abd Razak and Saad 2007). As highlighted by many authors, such as Leydesdorff and Etzkowitz (1998), Martin (2000), Harman (2002) and Calvert and Patel (2003), universities are increasingly undertaking entrepreneurial tasks and creating opportunities through business development.

On the whole, and as emphasized by Etzkowitz and Leydesdorff (1997), the triple helix model is about the interactions and relationships between university, government and industry. However, the organizing principle and its nature and form are inevitably different from

one country, and indeed from one context, to another. For instance, a developing country like Malaysia might require a reduced role for the government and a greater role for other institutional bodies such as local public universities, whereas in others, a more active and enhanced role from the government is needed (Abd Razak and Saad 2007). In brief, according to Etzkowitz (2003), the triple helix model comprises three basic elements:

1. A prominent role for the university in innovation, on a par with industry and government in a knowledge-based society. In Malaysia, the government is striving to encourage universities to be actively involved in research and commercialization (*Sunday Star* 2007).<sup>2</sup>
2. A movement towards collaborative relationships among the three major institutional spheres, in which the innovation policy is an outcome of interactions among the spheres rather than a prescription from the government or an internal development within an industry. Several authors have attempted to highlight the complexity of collaborative relationships in the context of developing countries, such as Saad and Zawdie (2005) for Algeria; Sutz (2000) for Latin America; and Malairaja (2003) for Malaysia.
3. In addition to fulfilling their traditional functions, each institutional sphere also 'takes the role of the other' (Etzkowitz 2003, 309).

## EVOLUTION OF THE TRIPLE HELIX INSTITUTIONAL SYSTEM

According to Etzkowitz (2003, 302), the transition of the triple helix model starts 'from two opposing positions: a statist model of government controlling academia and industry, and a laissez-faire model, with industry, academia, and government separate and apart from each other, interacting only modestly across strong boundaries'. The next stage in the evolutionary process is the hybrid form of triple helix in which each institutional sphere keeps its own distinctive characteristics and at the same time also assumes the role of the others. The signpost in the evolutionary process underlying the triple helix system is graphically depicted in Figure 11.1.

The major element for a statist triple helix element is that the government plays the major role 'driving' academia and industry while at the same time planning and controlling and managing activities aimed at encouraging innovation. Meanwhile, industry is regarded as the national champion whereas the university's role is reduced mainly to teaching and academic research (Etzkowitz 2003). The benefit of this model is that industry and universities will receive strong support and guidance from the government. However, with this model, neither government nor industry will be able to

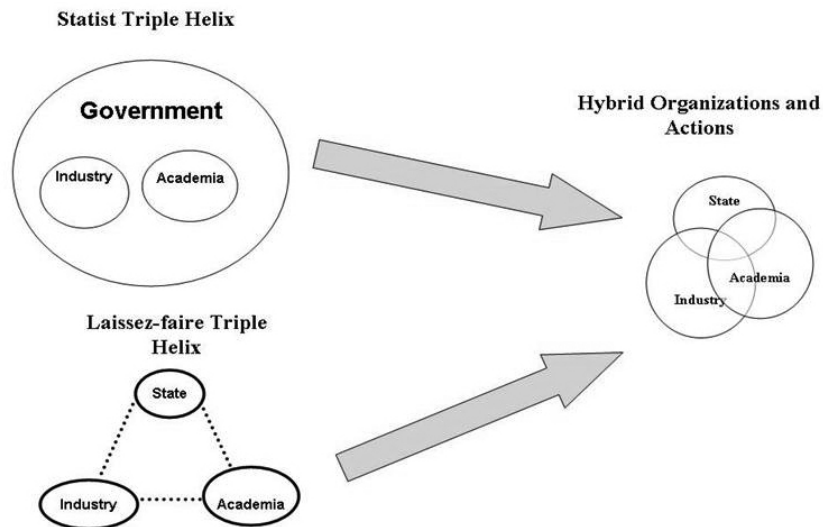


Figure 11.1 Evolution of the triple helix system.  
Source: Etzkowitz (2003).

exploit the potential knowledge-generating activities within universities as both teaching and research tend to be far removed from industry needs and universities do not have any incentive to engage in the commercialization of research (Etzkowitz 2003).

As for the laissez-faire triple helix model, governments, universities and industry operate independently as separate institutional spheres (Etzkowitz 2003). The firms are expected to operate completely apart from each other in competitive relationships and are only linked through market forces. The government's role is limited to dealing with only those problems that can be regarded as market failures (Etzkowitz 2003). In this model, industry is the driving force, with the other two spirals acting as ancillary supporting structures. In the laissez-faire triple helix model, the individualistic mentality is more prominent and creates a type of 'heroic' entrepreneur. The advantage of this model is that industry will be able to grow without any undue interventions by the government. However, the main downside is related to the difficulty for the three institutional spheres to interact in a way that would maximize the synergy in the relationship, and therefore benefit from value inherent in each sphere.

A third transition is the hybrid triple helix model where each institutional sphere keeps its own distinctive characteristics while at the same time being able to assume the role of the other (Etzkowitz 2003). All three spheres within this model will be able to interact and collaborate

with one another actively in order to promote strong innovation activities. All of them will gain values from each other which can help them achieve common long-term strategic goals. However, the problem with the hybrid triple helix is that its emergence as an institutional system could be elusive, as it involves a complex process based on high levels of commitment, understanding and trust between all three spheres (Abd Razak and Saad 2007; Saad, Zawdie and Malairaja 2008). The next section discusses the application of the triple helix model to the Malaysian context.

### EVOLUTION OF THE TRIPLE HELIX INSTITUTIONAL SYSTEM IN MALAYSIA

The Malaysian government started to recognize in its second National Science and Technology Policy the increasing importance of the collaboration between universities, government agencies and private industrial partners (NSTPII 2000; Malairaja and Zawdie 2008). This is regarded as an attempt by the government to shift the national economy from a labour-intensive manufacturing base to a knowledge economy; therefore, in concordance with the demands of the turbulent and increasingly competitive environment of the twenty-first century. The government has, for instance, developed several means to promote strong links among universities, industry and government through funded programs such as the intensification of research in priority areas (IRPA), which is central to the completion of the Eighth Malaysian Plan (2001).

The Malaysian government started to also acknowledge the importance for industries and universities to be less dependent (on the government) and to become more active in promoting innovation. For example, the percentage of innovating firms in the manufacturing sector (35 per cent) has exceeded that of Portugal (26 per cent) and Spain (29 per cent; see Malaysian Science and Technology Information Centre [MASTIC] 2004). However, the rate of innovation in other European countries such as Ireland (74 per cent), Denmark (71 per cent) and Germany (69 per cent) was significantly higher than that of Malaysia. The survey conducted by MASTIC for the period 2000–2001 also indicates that, in general, large-sized firms are more innovative than the smaller firms, where they account for 25 per cent of the total number of innovating firms. However, the number of smaller firms active in innovation is, as illustrated in Figures 11.2 and 11.3, considerably higher than the corresponding figure of 1.8 per cent for the 1997–1999 period (MASTIC 2004). There is also clear evidence from Figures 11.2 and 11.3 that the percentage of innovating entrepreneurs (sole proprietorship) has increased dramatically from 0.5 per cent to 12.9 per cent.

As already discussed and highlighted in Chapters 7, 8 and 12, the triple helix model is essentially based on a prominent and more entrepreneurial role

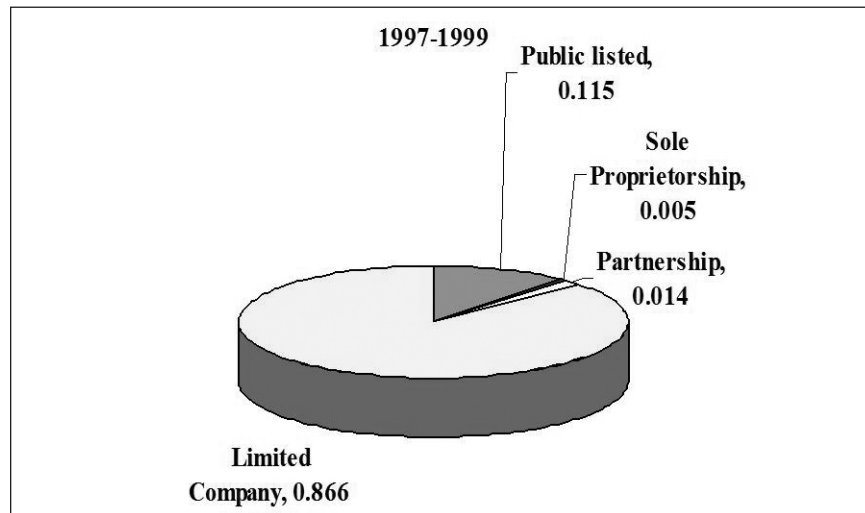


Figure 11.2 Ownership structure of innovating firms (1997–1999).  
Source: MASTIC (2004).

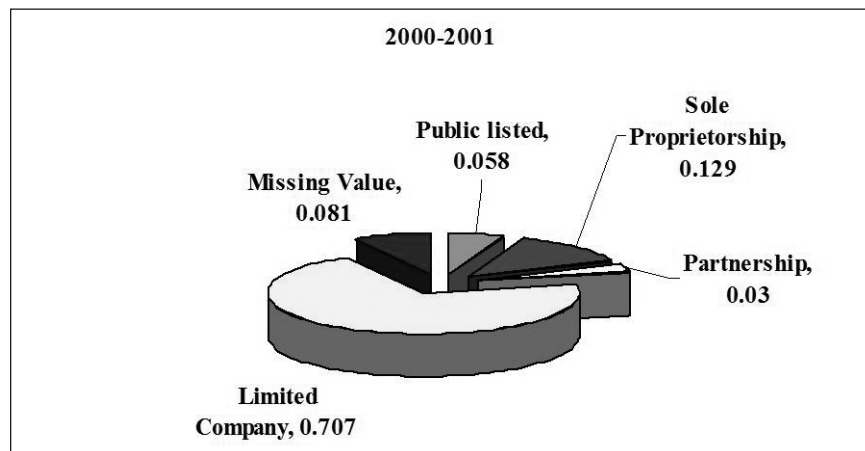


Figure 11.3 Ownership structure of innovating firms (2000–2001).  
Source: MASTIC (2004).

for the university in the creation and diffusion of knowledge and innovation. There is, in the context of Malaysia, evidence of entrepreneurial behaviour as some of the local public universities have set up or are in the process of setting up commercial arms (a private holding company). An example of this is the establishment of USains Holdings (the university’s commercial arm) by the University Sains Malaysia (Malairaja 2003). Furthermore, the Malaysian government has recently conferred research university status to its top four local universities which are designated under the Ninth Malaysia Plan to be the country’s first full-fledged research universities.<sup>3</sup>

Studies by Abd Razak and Saad (2007) and Malairaja and Zawdie (2008) have provided some further evidence suggesting that universities in Malaysia are being perceived by their partners as being of good quality, credible and capable researchers. The majority of the respondents in the interviews in this study stated that universities in Malaysia are determined to launch active relationships with the industrial sector. However, according to Abd Razak and Saad (2007), these relationships are more related to educational development, consultancy and training. The university is seen by respondents, from both the government and industry, as a key institution that can provide consultations and advice (mostly based on technical expertise). In fact, the government also uses universities to implement its policies (Abd Razak and Saad 2007). For example, the government is using the universities to implement its policies in increasing the number of researchers, IT workers and researchers for the country to achieve its Vision 2020<sup>4</sup> (MASTIC 2004). Table 11.1 provides a summary of how Malaysian universities are perceived by their partners. Further explanations regarding the table are given in the research methodology section.

Table 11.1 Current Perceptions of Malaysian Universities

Role of universities	Status of universities	Credibility and capabilities	Procedures and structures	Culture of partnership within universities	Type of relationship with government and industry
<ul style="list-style-type: none"> <li>• Clear evidence of the desire to see the universities being more entrepreneurial.</li> <li>• Some universities are more entrepreneurial than others.</li> <li>• Establishment of the research universities.</li> <li>• A clear definition of <i>research universities</i> is required.</li> </ul>	<ul style="list-style-type: none"> <li>• Does not really reflect the quality of teaching and research institution.</li> <li>• The effectiveness of the relationship does not depend on the status of the universities.</li> </ul>	<ul style="list-style-type: none"> <li>• The local universities have capable researchers.</li> <li>• The main issue is about the flexibility and the attitude of the universities towards change.</li> <li>• Still lacking in capability and experience in strengthening the relationship between universities and industries.</li> </ul>	<ul style="list-style-type: none"> <li>• There is still some room for improvement about the efficiency of procedures within universities.</li> <li>• Need to reduce red tape.</li> </ul>	<ul style="list-style-type: none"> <li>• High competitiveness between universities and researchers that limited the culture of partnerships.</li> <li>• Significantly depending on the individual staff.</li> </ul>	<ul style="list-style-type: none"> <li>• Act as a consultant for both government and industries, especially in the area based on technical expertise.</li> <li>• Universities are places for government to implement the policies.</li> <li>• More active relationship in commercialization of experts such as education, consultancy, training and development.</li> </ul>

Source: Abd Razak and Saad (2007).

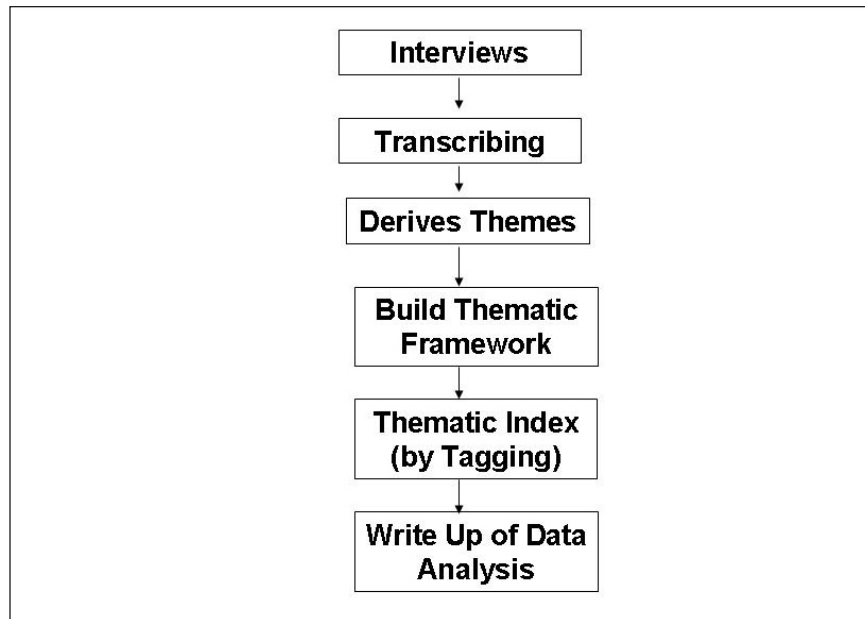


## RESEARCH METHODOLOGY

This research is achieved through the use of a qualitative case study approach which, according to Yin (1994), is an empirical inquiry of a specific contemporary phenomenon within its real-life context. Such an approach is useful where the boundaries between the phenomenon and the context are not clearly evident (Yin 1994), as featured in the Malaysian context. For the purpose of this study, semi-structured interviews were used to elicit information from managers.<sup>5</sup> The interview questions were semi-structured as they can include specific and closed questions in order to obtain specific information or confirm facts about open-question answers. They were also aimed at encouraging the interviewees to provide an extensive or developmental answer which may be used to obtain deep and rich data (Eisenhardt 1989).

The samples for the interviews were taken from the three spheres of the triple helix: the government (government ministries and agencies), universities (researchers, deputy vice-chancellors and staff from research management centres) and industries (managers and executives). All of the eighteen respondents constituting the sample were carefully selected to represent the position of stakeholders in the evolving triple helix institutional culture in Malaysia. The university respondents were from seven different universities of which four are categorized as research universities. From the government sphere, there were seven respondents in total, of which five were from different government agencies<sup>6</sup> and the other two from the Ministry of Science, Technology and Innovation (MOSTI). There were four respondents from industry: two from local and two from international multinational corporations (MNCs).

The data was analysed using the thematic analysis approach. It was later transcribed, from which several patterns were identified. According to Aronson (1994), from interviews, the ideas and patterns can be better understood by using thematic analysis. Therefore, it is relevant to this study to use thematic analysis as it is focusing on a developing country and aimed at better understanding the role of each actor (in the triple helix model) and the relationships between them. According to Taylor and Bogdan (1984) and Leininger (1985), these patterns can be later identified as the main themes. The next step was to catalogue the sub-themes or, according to Ritchie and Lewis (2003), create a thematic index. This has led to a clear identification of a pattern expanding from this process which was followed by the development of a valid argument justifying the choices of themes (Aronson 1994). This approach is based on greater links between findings from the literature review and the data collected. It leads to facilitating of the analysis and bringing a greater degree of validity to the study (Ritchie and Lewis 2003).



*Figure 11.4* The process of data analysis.

*Source:* Derived from Ritchie and Lewis's (2003) approach.

#### LINKS WITHIN TRIPLE HELIX INSTITUTIONAL SYSTEM IN MALAYSIA

To evaluate the type and quality of links existing within the triple helix institutional system in Malaysia, the discussion is divided into two sub-themes which investigate the current situation and views on effectiveness of the links in Malaysia.

All the respondents suggested, and agreed, that links between the three key spheres exist in Malaysia. According to a senior general manager of a commercial arm of one of the local universities, there are several government agencies such as the Invest Penang and PSDC<sup>7</sup> striving and working towards improving the relationship between university and industry. The type of collaboration (in this particular case, for an MNC) as highlighted by a senior manager of manufacturing and training is more inclined to develop programs on training and educating staff at universities. He elaborated that the company has given a monthly salary for lecturers to conduct training programs especially related to fibre optics as the industry is very new. For Sharma, Garg and Wani (2004), it is the university's role to prepare and make available trained manpower with the right type and level of knowledge, attitude and skill base needed by the industry. Furthermore, effective utilization of resources and interactions between industry

and university is crucial for the improvement of their respective efficiency, productivity and quality.

In the case of the biotechnology industry, the responses were quite encouraging. However, the respondents found it difficult to define the level of effectiveness and the types of collaboration achieved between the university, industry and government in Malaysia. As mentioned by a general manager of a government agency, this difficulty is related to a lack of studies on the triple helix relationships in Malaysia.

Having acknowledged that the relationships between university-industry-government exist, all respondents believe that there is still significant room for improvement and it is not yet at a satisfactory level, as suggested by the deputy vice-chancellor of a local university: 'It is moving, but we need a more speedy progress to deliver this especially with RM9<sup>8</sup> activities'. This view, as illustrated in the following quote, was also echoed by a senior government officer: 'We need the improvement, from our Seventh and Eighth Malaysian Plan, therefore, in our Ninth Malaysian Plan, hopefully it will be more about commercialization, demand and supply'.

The current nature of the links is essentially related to the technical training, education and professional development, especially with MNCs. This type of relationship is also identified by a senior manager of an MNC who claimed that they have hired some university lecturers even though they do not have hands-on experience on knowledge transfer, training and developing new products.

The preceding discussion highlights the following three major findings regarding the implementation of triple helix relationships between key institutions in Malaysia:

1. Links between the university, industry and government exist; however, their level and effectiveness remain uncertain.
2. There is still significant room for improvement although for certain industries like Biotech the links are blossoming.
3. The current nature of the links is more about the technical training, education and professional development, especially with MNCs.

#### **CHALLENGES ARISING IN THE EVOLUTION OF THE TRIPLE HELIX INSTITUTIONAL SYSTEM IN MALAYSIA**

The analysis of the interviews identified the following seven main groups of challenges which influence the introduction of the triple helix approach within Malaysian universities. The findings of this study are consistent with several other studies. Saad (2004), for instance, highlighted the need for effective governance by the developing countries. This is certainly true for Malaysia, especially with the administration of universities. The

issues are summarized in the following with supporting verbatim evidence from respondents.

### **Technological and Human Resources Factors**

Malaysian universities are lagging behind in terms of expertise in the development of new and advanced technologies, such as fibre-optic technologies. As emphasized by a senior manager of an MNC, most Malaysian universities are not well prepared and do not even have the resources and equipment to develop new and innovative technologies. This was also noted by Schramm (2004), who argues that research, especially in life sciences, computing and engineering, has not been successfully commercialized largely due to bureaucracy and lack of applied skills and resources in universities.

All the respondents also highlighted the lack of human resources in science and technology development as an ongoing issue for Malaysia. A resolution from the Malaysian Science and Technology Convention (MASTEC) identified, in 2003, several issues related to human resources development in the country. These issues, which include the low supply in skills development, inappropriate policy instruments to encourage in-house employee training and the inadequate supply of lecturers and instructors in skills development, were perceived to be the main causes for the lack of human resources in science and technology. The number of researchers, despite an increase from 15.5 to 18.0 researchers per 10,000 between 2000 and 2002, remains relatively low when compared to international standards (MASTIC 2004).

### **Policies, Procedures and Processes within the University**

Universities are faced with the dilemma and debate about the balance between teaching and research responsibilities. According to a fellow researcher working for an MNC, universities are having problems managing resources and time between research and teaching.

Universities also face the issue of inflexibility of staffing policies that prevent them from hiring the right staff for the right jobs. One of the main difficulties is related to the lack of experts in technology transfer, which is crucial for the relationship to ensue with the industrial sector. Furthermore, according to a senior manager of a university's commercial arm, these factors have contributed to the quality and speed of work of the university, as the staff is only allowed 40 per cent of its time for consultancy. It takes academic staff two years to do what the full-time staff can do in one year.

### **Commercialization Issues**

Commercialization has always been identified as a key challenge for the effective establishment of university-industry-government relationships. A

lack of entrepreneurs and of support from industry (for funding) seems to be central to poor commercialization. As highlighted by the director of a government agency, 'a critical mass of experienced and skilled entrepreneurs is needed both within the industry and university spheres'. Entrepreneurs wanting to commercialize their product to medium-sized companies may perhaps be interested in purchasing the foreign technology rather than relying on local universities to develop it. More funding and support (from industry) is needed. However, the existing regulations and practices related to the funding and loan applications remain very rigid and need to be changed and improved.

The preceding factors are mainly related to the issue of links between academic and industrial actors, as suggested by Danell and Perrson (2003), for whom a region needs a critical mass of interacting academic and industrial actors in order to develop technologically and prosper in economic terms.

### **Relationship between the Main Stakeholders and Spheres**

On the whole, there are issues of misperceptions related to the nature of the actual relationship and its parameters and boundaries. The industry perceives university staff as being 'too theoretical' (senior manager of MNC) and not having 'sufficient practical knowledge about real-life situations' (senior government officer of a government agency). According to a senior government officer, this lack of exposure and knowledge about industry has affected the nature of their relationship and the type of collaboration with their industrial and academic partners. Furthermore, universities appear to be unable to prioritize the strategic research areas which correspond to the industry's interests. It is evident that the engineering and science faculties are receiving more demand for collaboration from industry (through consultancy and research projects) as opposed to the social science faculties. However, it can be risky and inappropriate for this type of relationship to emerge only in certain faculties and not in others.

The perception of universities by the industry also affects the relationships between the university and its main partners. For instance, small and medium enterprises (SMEs) often perceive universities as 'ivory towers'. A significant number of industry managers still consider overseas researchers are much more capable than locals. There is also a feeling that no formal procedures are embedded in order to harness a continuity that will promote long-term relationships between universities, government and industry. The relationship is very much based on, as one respondent put it, a 'need-by-need basis'.

Meanwhile, several respondents from industry highlight that it is industry that should create the initiatives, and that they require help and guidelines from the government about handling the academia–industry relationship.

### **Work Cultures**

The apparent difference in work cultures between the universities, industry and the government was raised by several respondents as an important issue in managing the interrelationships in the tripartite model of the helix model. One of the main issues in work cultures is the response time (timeliness) especially between the universities and industry. The CEO of a state investment agency highlighted that timeliness is the biggest barrier in the relationship. According to a senior manager of one MNC, it is simply because universities and their staff are not ready, or do not fully comprehend the work culture of industry.

This difference between cultures is also raised by a senior manager of a university's commercial arm, for whom 'industry wants things very quickly at their pace of time, however, we (the university) always insist that we need to take into consideration our teaching responsibilities, which is the major duty for Malaysian academics, whether we like it or not.'

### **Intellectual Property (IP)**

There is also evidence that the Malaysian government is planning to set up a broad intellectual property (IP) policy. However, some concerns about the clarity of this policy and its guidelines have been expressed by representatives from key stakeholders from the university, government and industry spheres. Current IP policies and practices are seen as significantly affecting the nature of relationships between the universities, industry and the government. This view is clearly echoed by the following quote from one senior government official:

IP is the most important barrier. In Malaysia we don't have a clear IP guideline. There is like fifty-fifty partnership. However, for both the industry and universities, they are still confused with the IP requirements. It is because the IP awareness in Malaysia is still low. We basically need clearer guidelines.

### **Government Policies**

It was noted by several authors, such as Gibbons (1998), that government policy is one of the important factors contributing to the change of roles in universities. This is quite evident in Malaysia, with the introduction of government initiatives to establish research universities. However, the inflexibility, inconsistency, rigidity, vagueness and lack of direction in government policies are examples of the main challenges stressed by respondents from all parties. One senior government officer suggested that the country needs clear direction and the ministries should communicate with one another to make sure there is a focus in terms of direction and policies.

The issues related to the government policies are summarized by the senior government officer:

There are so many policies such as education policy and science technology policy. For example, now we have fewer than sixteen scientists per ten thousand people. It is our aim to achieve twenty scientists per ten thousand. However, we are not clear on what do we have to do in order to achieve this aim. That is, as a result of lack in clarity [as] every ministry is doing its own things.

## CONCLUSION

From the findings and discussion in this chapter, it is obvious that the Malaysian government continues to behave as the dominant sphere in the development of knowledge and innovation. Both academia and industry remain dependent upon the government in terms of overall coordination, objectives, planning and resources. However, the respondents from universities cited in the study raised concerns regarding clarity from government sources. This, as discussed earlier, corresponds to a statist triple helix model. However, the universities and industry are still operating separately and they are only linked through the market need which is a key feature of a laissez-faire triple helix (Etzkowitz 2003).

Although all the institutions have made an effort to move the triple helix relationship into the next transition, there are still key issues and challenges that need to be overcome. For example, efforts should be made to address issues such as commercialization, IP policy and differences in work cultures. It is clear that the situation has been improving for the past ten years with the introduction of policies aimed, to a certain extent, at strengthening the role of universities and their links with their immediate external environment. However, there is no doubt that the government, industry and universities need to work closer with one another. All respondents agree that there is still a long way to go and a strong commitment is clearly required from all parties for the successful implementation of the triple helix institutional system in Malaysia. This study has provided seven key areas which can form a platform for interrelational development between the partners for the Malaysian context and therefore provide a public policy agenda for the successful implementation of the triple helix model.

## NOTES

1. Each university received RM50 million (U.S.\$15 million) for research, development and commercialization activities (*Sunday Star* 2007).
2. *Sunday Star* is the Sunday edition for the Malaysian daily newspaper *The Star*.

3. Each university received RM50 million (U.S.\$15 million) for research, development and commercialization activities (*Sunday Star* 2007).
4. Vision 2020 is a program dedicated to Malaysia's aspiration to be a fully developed country by the year 2020.
5. According to Saunders et al. (2000), managers in developing countries are more likely to agree to be interviewed than to complete questionnaires.
6. The five agencies are: Invest Penang (a state investment agency), Malaysian Technology Development Corporation Sdn Bhd (MTDC), Small and Medium Industries Development Corporation (SMIDEC), Malaysian Agriculture Research and Development Institute (MARDI) and Kulim High Tech Corporation (owned by a state government).
7. Penang Skills and Development Centre.
8. Ninth Malaysian Plan.

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