FACTORS FOSTERING THE FORMATION OF SPIN-OFF COMPANIES BY SELECTED UNIVERSITIES IN MALAYSIA

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Abstrak

Spin-off bermula dari universiti dan juga institusi-institusi penyelidikan yang ditubuhkan sama ada oleh pelajar mahupun pekerja di sesebuah organisasi berkenaan. Untuk melihat sejauhmana pentingnya pembentukan spin-off, kajian ini memfokuskan kepada proses membuat keputusan untuk membentuk spin-off itu dilakukan. Secara spesifiknya, kajian ini bertujuan untuk mengenal pasti faktor-faktor yang mempengaruhi proses membentuk syarikat spin-off. Objektif kajian adalah untuk mengkaji kenapa penyelidik memilih untuk menubuhkan syarikat spin-off dan menganalisis faktor-faktor yang mempengaruhi pembentukan syarikat tersebut. Data diperolehi daripada 15 orang responden dan dianalisis menggunakan perisian NVivo versi 2.0. Daripada kajian yang dijalankan, didapati faktor-faktor utama yang mempengaruhi keputusan untuk membentuk syarikat spin-off adalah kesedaran dalam kalangan para penyelidik, pembuat polisi, pihak kerajaan, pihak universiti dan juga usahawan-usahawan daripada luar. Dalam masa yang sama, didapati pembentukan syarikat spin-off juga dipengaruhi oleh peluang, motivasi, peranan Technology Transfer Offices (TTO), peranan para penyelidik, latar belakang teknologi dan juga insentif ataupun sistem ganjaran yang ditawarkan.

INTRODUCTION

Spin-offs are an important class of firms because they are an economically powerful subset of high technology start-up (Shane 2004). Consequently, many university administrators, policy-makers and would-be entrepreneurs, both inside and outside the academia, have become very interested in these firms, indirectly spurring universities globally to begin investing a significant amount of resources in their development (Huggins, Johnston & Steffenson 2008; Siegel, Wright & Lockett 2007).

With increasing pressures for universities to generate economic returns from government research support, there is growing concern globally on how policy-makers and academics can stimulate technology-based entrepreneurship from universities. Although extensive researches

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have been done on spin-off formations around the world, studies on factors fostering spin-off formations in Malaysia have never been conducted.

LITERATURE REVIEW

The process of forming spin-offs has always been part of university activities, perhaps due to the practical orientation of many in the fields of engineering and science. Besides, it is also due to the supporting activity of spin-offs which has increased over time within institutional environments, coupled with the extensive study regarding the important contribution of university spin-off companies towards local economic development (Etzkowitz 2002; Etzkowitz 2003; Shane 2004). For example, the roles of Route 128, Silicon Valley in the United States and the Science Park in Cambridge in the United Kingdom (Oakey 1995; Etzkowitz 2003) are recognised by policy-makers as the foundations for industrial innovations that can trigger and stimulate local economic development.

International context

The United States modelled its first university system from Germany and demonstrated the commercialisation of technology through spin-offs by university professors throughout the 19th century. Nonetheless, efforts to commercialise university technology in US were limited due to the relatively limited level of technology production in university at that time and because of the relatively small size of universities prior to the 20th century (Shane 2004). Moreover, academic institutions in United States spent more than 20 years focusing on the central forces leading to the dramatic rise in spin-offs activity, such as the passing of the Bayh-Dole Act 1980, the birth and growth of biotechnology, changes in US patent laws, industrial growth and the changes in the new firm financing process.

Commercialisation activities of university patented technology increased after World War I in 1920s (Movery & Sampat 2001), probably as a consequence of development of the Land Grant University in 19th century as one of the American University Systems (Golub 2003; Shane 2004). However, the degree of commercialisation effort during the first part of the post-World War II was relatively low (Shane 2004). American universities started their formal commercialisation process by the creation the Massachusetts Institute of Technology (MIT) in 1932 and it was the first private university in the United States to institutionalise invention disclosure policy. After that, American universities that emerged in the

interwar period formed formal university technology transfer units (Mowery & Sampat 2001). This formation of administrative units for technology transfer allowed universities to organise their intellectual properties and managed them for the benefit of the university as a whole (Mowery & Sampat 2001; Shane 2004). Furthermore, the rise in federal funding for American universities also led many of the largest research universities to further develop their technology commercialisation policies and procedures, largely in response to demands from their federal funding sources to develop formal policies on patents and other intellectual property (Mowery & Sampat 2001).

According to Fini et al. (2008), researches also have been carried out among Italian academics involving the creation of academic spin-offs. For example, Emilia Romagna has been recognised by the European Commission as one of the leading regions in Europe for its increasing number of research start-ups and its proactive role in supporting research-to-industry technology transfer. In November 2003, the Emilia Romagna region adopted its first Program to Support Industrial Research, Innovation and Technology Transfer (PRRIITT), aimed at fostering applied research through new collaborations between public researchers and industries, the construction of new research laboratoryoratories by the industries and the creation of research spin-offs. It was the first case of an Italian region with its own law concerning innovation.

Malaysian context

Malaysia's desire to be a developed nation by 2020 requires a consummate ability to convert natural resources into high value-added product. To realise this vision, research and development (R&D) is crucial. Endowed with vast supply of natural resources, Malaysia is well placed to venture into new blossoming industries such as the life science technology, better known as biotechnology. Furthermore, the shift of consumer demands from synthetic to natural product promises a bright future for the industry.

In Malaysia, the formation of spin-off companies is very limited. Due to the increasing awareness regarding the potentials from spin-offs formation, the Malaysian Government has included the following thrusts in the 9th Malaysia Plan:

1. The first thrust is to move the economy up the value chain. The Government aims to increase the value-add of existing economic sectors as well as generate new knowledge-intensive activities and employment in ICT, biotechnology and services. It will also build an environment which encourages the private sector to take a leading role in the country's economic development.

2. The second thrust of the National Mission is to raise the country's capacity for knowledge, creativity and innovation and nurture 'first class mentality'. Malaysia's future success depends on the quality of its human capital, not only in terms of intellect but also character. Therefore, in line with this thrust, the Government aims to undertake comprehensive improvement of the country's education system, from pre-school to tertiary and vocational institutions. A more enabling environment will also be fostered to encourage Research and Development (R&D). At the same time, heavier emphasis will be placed on the shaping of values to create more well-rounded individuals.

Therefore, the Technology Incubator Programme will be enhanced to develop a sustainable pool of indigenous technology entrepreneurs (techno-preneurs) and technology-based companies. It will be integrated into the broader strategy of enhancing utilisation of new knowledge and technologies produced by universities and research institutions. Additionally, realising that financing is a key enabling factor, measures will be undertaken to improve financing mechanisms and access for finances. To further encourage innovation, technology transfer and commercialisation, the existing intellectual property (IP) framework will be strengthened to enhance IP support facilities and to shorten the IP approval process. Techno-preneurship development programme will also be organised as part of the effort to nurture a Bumiputera Science and Technology Community (9th Malaysia Plan 2006). Towards this end, studies were conducted at University of Technology Malaysia (UTM) and University Putra Malaysia (UPM) as case studies to identify and thoroughly explore the factors that influence the decision-making process in spin-offs' formation in Malaysia.

METHODOLOGY

The current research is essentially a case study of University of the Technology Malaysia (UTM) and the University Putra Malaysia (UPM). The respondents of the study were selected based on purposive sampling. The sample units are chosen because they have particular features or characteristics which enable detailed exploration and understanding of the central themes and puzzles which the researcher wishes to study.

In order to achieve heterogeneity, our respondents comprise all the individuals involved in the decision-making process of spin-offs formation at the UTM and the UPM. For the purpose of clarity and

comprehensiveness, 15 in-depth interviews were conducted each of which ranged from 40 minutes to one and half hours at both universities to obtain the understanding, knowledge, experience and viewpoints regarding the factors that influenced the decision to form spin-offs. The researcher asked the respondents for specific information and requested them to explain and elaborate on the factors that influence the decision to form spin-offs. Hence, a list of guiding questions (semi-structured and open-ended questions) were used to gain detailed information.

The interviews were tape recorded and transcribed for further analysis. The qualitative data from the interview transcripts were then analysed using computer-assisted qualitative data analysis software (CAQDAS), NVivo to identify themes which emerged from the study. All the data were analysed using case analysis and cross-case analysis. According to Gibbs (2005), NVivo is better in supporting the type of research that most social scientists are involved in. This is because NVivo is suitable for data manipulation, idea-stimulating in its searching function, enables researchers to introduce new data throughout the project, and flexible in deciding on how the theoretical model is constructe

FINDINGS

Factors that influence the decision-making process in spin-offs formation between both UTM and UPM were identified in detail. The researcher found seven major themes after analysing the data using the CASCAQ analysis and clustering them into awareness, motivation, opportunity recognition (availaboratoryility of resources or facilities), TTO roles, funding, inventors roles or involvement (management and networking) and incentive or reward. These factors are detailed below.

i. Awareness

The researcher found that awareness is a key theme. From the research conducted, 86.67% of the respondents agreed that the awareness influenced the decision-making process in spin-off formation. Identifying potential users who are aware about the new technologies is challenging. Therefore, the TTO should play an important role as a mediator between the commercialisation projects and the relevant support instruments (Rasmussen 2008). Besides, according to Fini et al. (2008), the awareness of the important contribution that academic spin-offs can give to economic development has pushed several countries towards legislative changes in order to create the necessary conditions for an effective commercialisation of research results. For example, in the US, the turning point is considered

to be the approval of the Bayh Dole Act in 1980 and the provision of the Follow-On Rights in 1984. According to Shane (2004), both reforms have made it significantly easier for universities to license and commercialise federally founded inventions, facilitating the formation of spin-off companies interested in licensing and developing these technologies.

Therefore, the awareness should come either with the mediation of TTO or directly from inventors themselves. Since the establishment of ICC, they worked very hard and have made a lot of improvements. According to UPM TTO officers, the first patented IP at UPM was filed in 1990, but the level of awareness was too low due to the fact that the university focused more on publications. So, after the incorporation of the ICC in April 2006, they worked hard to safeguard the IP. This process takes time and must be planned carefully and with incentives being given to researchers. In addition, there were a lot of efforts on the part of ICC to enhance awareness among researchers. The ICC visited every faculty to inform about and discuss the commercialisation value is a case in point demonstrating their commitment in improving awareness regarding the issue. In establishing the spin-off companies, most of the awareness originated from the TTO. Meanwhile, in commercialising the R&D products, the awareness and all the information came from inventors as well as TTO.

At the UTM, however, the awareness to establish spin-off companies originates from the Director of CEPP and not from UTSB. Although the UTSB acts as a Technology Transfer Office, their tasks involve only preparing the MOU and MOA regarding the registration and establishment of the spin-off companies. The awareness in marketing the products emerged as the time taken for entrepeneurs to be aware of the products at CEPP was too long. Furthermore, according to Senior Marketing Executive, the awareness regarding the importance of spin-offs formation was augmented when there were inquiries from customers regarding their products. Due to the increase in demands for the products, CEPP had decided to establish Phyto Biznet Sdn. Bhd.

The level of awareness in commercialising R&D products are however varied as CEPP was R&D-based and the researchers were from different SBUs. Some of the researchers divulged that the awareness on certain issues resulted from their previous working experience in industries which involved extensive public relations. Further, the level of awareness among entrepreneurs regarding the safety and nutrition of certain products was too low. This could lead to various diseases and illnesses. A good example is the latest case of turmeric powder which use harmful ingredients and has caused negative health effects on consumers. It was a

clear indication of the ignorance or lack of awareness of the ingredients among consumers and of unethical practice on the part of the producers. Even though the scientists or researchers knew what was happening, no action were taken by the authority.

However, it was a different case at the UPM. Some of the awareness came from the researchers or TTO. Based on the current issues, the researchers conducted studies and were aware of the problems plaguing the society. However, they were lacking in recognition of the opportunities present in the market and were short on the awareness to commercialise their research product. Therefore, their TTO made numerous efforts including face-to-face meeting to

foster awareness regarding the significance and benefits of commercialisation of their products until they eventually agreed to market their products.

Overall, the study found that the level of awareness to form spin-offs was still at a low level. Despite the existence of spin-off companies at both universities, many students, academicians, other members of the staff and the society are still unaware of the emergence and the importance of spin-off companies. Hence, there is still so much to do to augment the awareness while increasing the number of spin-off companies.

ii. Motivation

According to Kroll (2009), motivation was the key factor because it connects the scanning and decision-making process of the individual and conveys relevant meaning to the results of the scanning process. It is also important in bridging the gaps between the pre set-up phases to the future entrepreneur's motivation. Academic spin-offs tend to frame the process of reasoning about the new venture creation in terms of continuum of motivating dimensions including the wish to become independent and recognition of opportunity.

The study found that the researchers were independent-oriented and the data gathered indicated that 80% of the respondent agreed motivation was the triggering factor influencing the formation of spin-offs. In order to increase the efficiency of the organisation, the level of motivation among each layer of the organisation is very important. For example, at the UTM, the level of motivation among the Phyto Biznet Sdn. Bhd. management was very high. They have a strong teamwork combined with a high level of motivation which enabled them to manage the company, staff, clients and projects properly and efficiently.

This strong relationship between motivation and teamwork is hard to be reproduced by other organisations. The prospect of higher income

was not the main motivation for them to be interested in entrepreneurial activities as their foremost interest was to gain university support and munificients as well as more enabling environment to set up viable research oriented spin-off projects. It can be proved by the t3, t5 and t4 from CEPP which explained the purpose of the establishment of the centre. They were not looking for higher income, but to commercialise R&D products which have laboratoryoratory potentials. Other reasons were to help the SME entrepreneurs, most of which were Bumiputera and to generate income for the university.

Nevertheless, it was the exactly same reason which encouraged UPM's researchers and their TTOs to establish spin-off companies. The importance of the researches and the fact that the products itself will benefit others were more important than higher income. The reason for this was probably that the growth of spin-off companies in Malaysia was at an early stage and the motivation among the researchers was still low. The satisfaction due to the successful commercialisation of the product was much more important to them compared to the profits to be gained. This is consistent with the assertion of Shane (2004), regarding the 'need for achievement' and the 'internal locus of control' among inventors.

iii. Opportunity Recognition (availaboratoryility of resources or facility)

The findings indicate that opportunity recognition is very important in the decision to form spin-offs. According to Siegel et al. (2007), there is very little material on how and who recognise opportunities to commercialise technology created in the universities. However, according to Franklin et al. (2001), internal and external resources such as academic inventors, university commercial company (TTOs), surrogate entrepreneurs or some external private sector organisations are very important to help the university recognise the opportunity in the creation of university spin-offs. At the same time, the author also highlighted that they always lack the technical skills and have their own agenda.

From the study, 93.33% of the respondents agreed that opportunity recognition was very important in the formation of spin-offs. At the same time, it was agreed that external and internal resources are very important in helping university recognise the opportunity. At the UPM, most of the opportunities were recognised by TTOs and inventors. Then, the decision to form spin-offs will be made by the inventors. For example, the TTOs recognise the opportunity to commercialise the educational materials from p2. When p2 agreed, TTO officers will proceed for the next stage.

However, if the products are kept on the shelves, the potential of the product will not be known to the public. As recognition of the opportunity is a very important stage in commercialising the R&D products, the inventors who recognised the opportunity could accelerate the decision to commercialise the product via spin-off creation. Sometimes, the recognition of opportunity may not come from the researchers themselves. It may originate from the TTO who need to be supportive when they realise that opportunity. For example, one of the inventors from the UPM did not realise the opportunity created by the technology they had. Supports and coaching from the TTO allowed them in commercialising their products successfully. The product of this research group was a multimedia software and a book for educational purpose to entice and enhance children's learning process.

On the other hand, it was a different case at the UTM because as a research-based centre, Phyto Biznet Sdn. Bhd. was formed by CEPP as a spin-off company. Then, in terms of opportunity recognition, it has been recognised either from the management or research officer. Normally, prior research or working experience in the industries help the inventors to recognise the opportunity and the current market demand and needs. As a research centre, the CEPP recieved a lot of visits especially among SME entrepreneurs who sought advice, asked for product improvement or inquired for specific products. For example, one client came to CEPP for a product based on coconut milk. To turn the idea into product, the CEPP needed to embark on thorough researches, requiring large amounts of investment. CEPP can turn this idea into a real product whilst at the same time publishing papers to disseminate their research findings to the public. At the same time, CEPP's clients also help the centre to recognise the opportunity, making it easier for the products to be commercialised. This is supported by O'Gorman et al., (2006), as they stated that the recognition of commercial opportunity occurred as a result of the scientists' efforts to develop or acquire market-related knowledge.

While the origin of these businesses reflects the prior knowledge of the scientists that stemmed from their research activities, the scientists did not have the contacts that would allow optimum assessment of the commercial potential of their innovations, and therefore they had to seek new market knowledge from external sources.

iv. TTO roles

According to Shane (2004), the selectiveness, supportiveness and effectiveness of TTOs' roles in pursuing the commercialisation route by a university depend on the level of investment that the university makes

in its licensing office, the experience and capabilities of TTOs' staff, the strength of networking the TTO have with other stakeholders in the university and what the objectives of the TTOs are. Then, according to Link et al. (2007), universities welcome this trend because formal technology transfer can potentially generate large sums of revenue, as well as build relations with external stakeholders and enhance economic growth and development in the local region.

Based on the study, it was found Technology Transfer Offices contribute a major role in recognizing the opportunity to form spin-off companies. However, the TTOs at the UTM only played their roles as a centre for company registration. The other roles or functions were taken by CEPP. Therefore, the UTM's TTO management needs to reassess their roles as a TTO with the support from the university management. They need to collaboratoryorate with the other TTOs from the other universities or organise some activities in which they can share their knowledge and experience in managing the spin-off companies.

UPM's TTOs were successful in their roles and managing their tasks. There, TTOs were responsible to find potential researchers at the faculty level by maintaining good relationships with the lecturers or researchers and organising a lot of activities at faculty and university levels. For example, ICC organised a road show covering every faculty at the university. Besides that, they also organised a course which invited a consultant from Australia and invited the Vice Chancellor (VC) to let the latter know and understand what commercialisation is, why it is important, what Intellectual Property is and what challenges they shall face. The ICC was also responsible for managing their teamwork and technology transfer.

Meanwhile, they were very supportive in helping the inventors to recognise the opportunity, providing consultancy services, formulating policies regarding intellectual property rights and commercialisation, creating the need for research, and developing a research culture at faculty and university levels. They improved their management style and organisation efficiency by providing training to lectures, establishing network with the industries, striving to achieve their own target and always seeking rooms for improvements. In addition, UPM's TTO was also responsible for persuading inventors or researchers to form spin-off companies. Sometimes, the inventors did not recognise the true value of their products. Therefore, the role of TTO is very important to improve their awareness, share the information with the inventors, provide service and guide them as much as they can.

v. Funding

The availaboratoryility and nature of external funding play a critical role in shaping research agenda and involvement in commercialisation activity (O'Gorman et al. 2006). As mentioned by t7, at the early stages of the setting up of CEPP, it took a lot of effort for CEPP to become a research centre and to incorporate Phyto Biznet Sdn. Bhd.. In order obtain funding, he had discussions with the University's Vice Chancellor, Majlis Perbadanan Kesatuan Sains Negara and the then Prime Minister, Tun Dr Mahathir Mohamed. Finally, his efforts came into fruition. Today, Phyto Biznet Sdn. Bhd. is financially independent in organizing activities and launching products. These days, CEPP and Phyto Biznet Sdn. Bhd. take the role of facilitators for entrepreneurs in obtaining funds from the government. Most of the time, they offer and provide a host of services to the entrepreneurs without any charges. The services provided by this institution illustrate their good relationship with clients and their ability to colaboratoryorate with other institutions.

Our interviews also found that funding is crucial as it is positively related to the number of spin-offs formed. This is backed by 80% of the respondents in the study. The government provides the funds for research in the form of Technofund, Bridging Fund, Seed Fund, CRDF. However, much more investments are needed to fully commercialise research products.

vi. Inventors roles or involvement (management and networking)

Inventors' roles or involvement is very important in the decision for spin-offs' formation. Inventors are responsible for developing products and marketing them if the product have commercial value. At the UPM, most of the researchers develop their products in the laboratoryoratory and they were aware the importance of their products. For example, p1 specialised in animal reproduction (in vitro fertilisation for sheep and cattle) and his experience in consultancy in ultrasonography for domestic and wild animal was instrumental in his decision to form a spin-off company. His 10-year research in the laboratory was expected to go full scale by early 2010 if everything goes according to schedule. His involvement in the research area will assure farmers get high quality cattle, as semen used for insemination will only come from genetically superior animals. He also promises that the service, which was initially offered by his Veterinary Service Department, is from life and good quality bulls and the semen

used are from animals which will ensure that they produce cattles with the highest quality.

Inventor p3 also highlighted that her more-than-20 years of experience in research and development has resulted in rapid protocols in plant micropropagation system and production of disease and stress tolerant plantlets with superior standard and uniformity. Through the innovation and production techniques, they have developed a bio-marker which is useful for early and large scale screening of protocorm-like bodies (PLBs) and to predict plants producing desirable flower colours that are robust with well predicted characteristics. Then, the inventors played their roles by establishing their subsidiary, Genetwister Life (m) Sdn. Bhd. which is a joint-venture with Genetwister Group International B.V. The establishment of their subsidiary is very important for them to strengthen their technology capabilities in profiling functional genomics. Therefore, the roles of inventors in the exploitation of new ventures mentioned by Shane (2004), shall be accepted. Likewise, Cooper and Daily (2000) cited by Ismail (2007), also discussed the same issue.

At the UTM, the inventor's roles are played by the management of Phyto Biznet Sdn. Bhd. They were responsible for managing the company and to build good relationships and networks with clients and potential outsourcers. Their managerial skills were very good. However, some of the researchers complained are unhappy that the research officer at the laboratory is below par.

vii. Incentive and reward/support/culture

According to Siegel (2007), there has to be incentives to encourage researchers to do more research. There may be a need to move beyond standard royalty-distribution and equity holding formula adopted by TTOs to make them negotiable in specific case contexts, such as reknowned researchers.

The study found that there exists no policy regarding the Intellectual Property Rights (IPR) at the UTM. At the same time, there were no royalty or equity to the researchers. At the research centre, the researchers act merely as a government servant. It is probably owing to this that no specific IP policies are formulated and implemented. Notwithstanding, the researchers receive a yearly bonus of different amounts based on their experience at the laboratory. Some of them receive between RM 300 and RM 500 and some between RM500 and RM 1000. The amount that they received is definitely too small compared to their commitment. However, our discussion with t6 revealed that it was good enough because Research Officers carried out their prescribed duties. However, during the training

or courses that they organise, they were paid professional fees within the range of 5%-10% of the cost of the courses. Due to the confidentiality of the formulation, CEPP seeks trademark registration to protect its formulation ownership. Therefore, the entrepreneurs can either buy the formulations of a certain products or ask CEPP to formulate for them as requested.

The Incentive and reward system, as well as support from all parties and the culture of the university were key contributors to form spin-offs. The number of spin-offs will increase if entrepreneurial culture exists, supports are reachable, and incentives and rewards are given by the university and the government. Incentives and rewards are very important to attract the researchers to involve themselves in spin-off formation. Support systems either from the faculty or from the university in terms of policy regarding spin-off and commercialisation should be established by the university. This is what differentiates the UPM and the UTM. The former has its own policy created by the ICC which acts as the TTO. The policy outlines the percentage of equity and royalty at 75% for the researchers and 25% for the university. However, 5% of the university's share will go to the ICC fund. Due to this policy, researchers at the UPM feel encouraged to form spin-offs and the number is increasing despite the ownership of intellectual property rights by the university.

CONCLUSION

Based on the findings, it can be concluded that there are several factors associated with the decision to form spin-offs at both the UTM and the UPM. These factors are awareness, motivation, opportunity recognition (availability of resources or facility), TTO's roles, funding, inventors' roles or involvement (management and networking) and the incentive and reward culture.

The research found that 86.67% of the respondents agree that awareness influences the decision-making process in spin-off formation, 80% for motivation factor, 93.33% for opportunity recognition, 33.33% for TTO roles, 80% for funding, 93.33% for inventors' roles or involvement and 73.33% for reward system or incentive. However, the lowest influence factor was the TTO role which is cited by only 33.33% of the respondents. This is due to the UTM's TTO not playing their role efficiently and effectively to increase the number of spin-off companies in the university. Therefore, there is a need for a clear policy and more efforts are needed on the part of UTM to spur and facilitate spin-off formation.

The purpose of the study is to provide an understanding on the issues regarding the factors that influence the decisions to form spin-offs. From the study, it can be concluded that, there are different reasons why the researchers decide to form a spin-off companies. These are to help the others (societies) by commercialising their products, to meet the current demands or needs of the customers, to exploit new technology, to get the higher income and the ability to use the resources. In the decision-making process of spin-offs' formation, the inventors are fully responsible to make the decision on whether or not to form spin-offs. The TTO, meanwhile, are not responsible to make the decision, they only act as a consultant and prepare the required information or resources.

The decision-making process in spin-off formation is very important in increasing the number of spin-off companies in Malaysia. As Vohora et. al. (2003) points out, the process of the development of spin-off companies go through five stages: 1) the research phase, 2) the opportunity framing phase, 3) pre-organisation phase, 4) the reorientation phase and 5) the sustainability phase. In order to develop, at each stage, a spin-off company encounters 4 critical junctures relating to resources, capabilities and network ties. The four critical junctures are 1) opportunity recognition 2) entrepreneurial commitment by a venture champion 3) attaining credibility in the business environment and 4) achieving sustainable returns within their perspectives markets. A firm is considered to be sustainable if it is capable of moving to the next stage within a certain period of time.

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