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A Framework for a Successful Research Products Commercialisation: A Case of Malaysian Academic Researchers

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Abstract

Research products commercialisation is one of the key agenda of the government to boost the economic growth in Malaysia. This has resulted universities and research institutes to consider commercialising research products as one of their critical activities for income generation. Although much emphasises and encouragement have been put forward to accelerate research products commercialisation related activities, however, commercialisation of research products especially among academics in Malaysia is less progressing and encouraging. It is said that commercialising of research products is a complex and risky process, and there are many possible ways to be adopted, especially relevant for academic researchers to guarantee its success. Thus, this paper aims to examine a generic framework for a successful research products commercialisation among academic researchers in Malaysia. For the purpose of the study, interviews were conducted with four academic researchers who have successfully commercialised their research products. Drawn from their experiences and insights, the study found that there are eight elements that contribute for a sustainable research products commercialisation. These elements are knowledge, skills and personal traits of the researcher, idea creation of the product, development, packaging and promotion of the product, paths of commercialisation, building competitive advantage within the market, selecting business partner, nurturing healthy relationship with business partner and facilities and supports. This study found that these elements are interrelated and interdependent with each other to achieve a sustainable research product commercialisation. These elements are useful for researchers and their business partners to develop an effective strategy for a successful research products commercialisation.

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1. Introduction

The commercialisation of technology innovation has been considered as one of the most critical agenda in Malaysia since 2008. In order to achieve high-income developed nation by the year 2020, Malaysia views that there is a need to cultivate the culture of innovation and creativity among nation. In the recent Economic Report 2013/2014, the Ministry of Finance has announced that innovation remains a focus in the country’s development agenda. Furthermore, responding to the agenda of the Tenth Malaysian Plan, the Ministry of Higher Education has addressed the commercialisation and innovation development as “Niche 1” which implies its importance in the development of the nation (Abd Aziz, Harris and Norhashim, 2011). The Malaysian government over the last 20 years has provided allocations, grants, subsidies and incentives to intensify research, innovation and commercialisation activities (Govindaraju, 2010). The National Innovation Agency has also been established in 2010 towards achieving a high-income nation status through “innovation economy”. Universities, research institutes and government have provided some supports to improve the commercialisation activities. However, commercialisation of the research products among academic researchers is relatively new and the success rate of commercialising of research products is still unsatisfactory. It has been reported that only a small percentage of the technology innovation from the university has been commercialised (Abd Aziz, Mohd Yusof & Mohd Idris, 2010; Low, Amran & Aslan, 2012). Among the reasons for the low performance is the lack of business acumen among researchers, a skill which is necessary for a success commercialisation (Low, Amran & Aslan, 2012). Furthermore, commercialisation of research products is a complex process and thus far, there is no single size-fits all approach to guarantee its success. Considering the recent emphasis of research products commercialisation, an understanding what elements and how these elements are interrelated for the success of research products commercialisation is necessary. Thus, the purpose of this paper is to discuss a generic framework for a successful commercialisation of research products among Malaysian academic researchers. A framework develops in this study based on case study conducted among four prominent academic researchers who have successfully commercialised their research products.

2. Literature Review

Generally universities and research institutions facilitate the creation and commercialisation of research products or commercialisation of intellectual property (IP) (Siegal & Wright, 2007). The topic for research commercialisation becomes a critical issue, and it is especially relevant for the university-based technology (Rothaermel et al., 2007). Thus, policy maker has perceived universities and research institutions as an engine for economic growth through commercialisation tools (Markman et al. 2008). Furthermore, how well a company manage to create value from technology commercialisation depends very much on what happens before the product is developed (Hamzah, 2011). There are various functions of research product commercialisation including for example that products should be based on industrial needs and relevant to private sector (eg Powers and McDougall, 2005; Agrawal & Henderson, 2002; Nicolau & Birley, 2003), to boost economic activities (Dietz & Boseman, 2005) and to create new jobs (Di Gregorio & Shane, 2003; Perez & Sanchez, 2003). In Malaysia, research universities have been perceived as the pioneer and catalyst for research commercialisation (Ramli et al., 2013). Moreover, university should bridge between the science and technology into entrepreneurial ways by commercialising researchers’ products (Phan & Siegel, 2006; Clark 1998).

There are different strategies available for research commercialisation in the university. Some institution opted for internal approaches, quasi-internal approaches and externalisation approaches (Markman et al., 2008). According to Siegal and Wright (2007), these strategies may be fostered by identifying products with commercial potential, continuing strategic and financial support for portfolio companies to maximise their chances of success. Furthermore, collaboration between regional universities, research centres and other organisations should be encouraged to emphasis for commercialisation (Siegal & Wright, 2007). Commercialisation activities are more valued, if incentives are rewarded for academics (Siegal, Veugelers & Wright, 2007). University will adopt
commercialisation policy and other key legislations to promote rapid diffusion of technology from universities to industry (Markman, et al., 2008). IP commercialisation policy has been designed to consider the ownership rights, profit sharing and other related rights (Ab Aziz, Harris & Norhashim, 2011). These policies are important to establish proper management of intellectual property rights (IPRs) and protect research product commercialisation related processes (Ramli, et al., 2013). Moreover, these policies are intended to provide support, guidance and framework to enhance researchers productivity (Ab Aziz, Harris & Norhashim, 2011). Other than research commercialisation policy, research management centre or technology transfer office plays an important role to develop, coordinate and facilitate commercialisation in universities (Sastry et al., 2007; Jensen & Thursby, 2001).

There are certain challenges to transfer research products into the market place. In the agricultural based research for example, although there are much potential for universities to be actively involved in commercialisation activities, it showed that farmers are not easily convinced to consider using technology developed by universities (Yaakub et al., 2011). For small firms, it was difficult to pursue commercialisation because they are not aware of IPRs system and the high cost involved in using the system (Siegal and Wright, 2007). There was also a problem to link between the academic and industry due to the tacit nature of knowledge (Etzowitz, 1998). The perception of academics and industry is also different towards commercialisation of the research products. Thus, the industries’ perception that the university is not a source of innovation should be changed (Rasiah & Govindaraju, 2009). Other related challenges including lack of funding, lack of collaboration between academic and industries, lack of emphasis on innovation and lack of human capital (Govindaraju, 2010). Although various incentives and rewards available for academic researchers to pursue their research commercialisation, these provisions have not been systematically organised (Yaakub et al., 2011). Lack of expertise in the relevant field and lack of expertise in management skills have also been identified as challenges for commercialising research products (San, Narayanasamy & Ahmad Dahlan, 2012). Thus, the relevant questions are; (a) what elements are important for successfully commercialising research products, and (b) how these elements are interrelated?

3. Methodology

3.1. Research Design

This study analyses eight elements that influence for the research products commercialisation in Malaysian universities to develop a generic framework of a research product commercialisation. These elements are knowledge, skills and personality traits of researchers, creation of idea, paths of commercialisation, product development and promotion, building competitive advantage in the market, finding suitable business partner, nurturing healthy relationship with business partner and facilities and supports. Each of these elements are interrelated with each other.

3.2. Sample and Data Collection

A qualitative research method has been adopted to identify the elements that influenced a successful research product commercialisation. Interviews were conducted with four academic researchers who have successfully commercialised their research products. The selection of the respondents is based on purposive sampling to ensure in-depth understanding (Patton, 2002) of the elements that determine a successful commercialisation of research products. The four respondents were selected based on their achievements in commercialising their research products and they are considered as key person in their area of expertise. They also have more than ten years experience in research activities and have received international recognitions for their research achievements. Further, they are professors attached at different university background and are identified as Professor J, F, H and K for the purpose of anonymity.

Face-to-face interviews were conducted using semi-structured interview questions for in-depth understanding of the elements for a research products commercialisation. The structure of the interview questions were designed
specifically to capture the respondents’ real experience, opinions and expectations (Patton, 2002) related to successful research products commercialisation. The interview session lasted for about an hour, and it was conducted at a different time and location. After each interview session, the interview data was transcribed and the meanings constructed from the interview data were e-mailed to the respondents for their approval. Their feedback on the meaning construction was sought as a means for cross checking and validating the data. They were allowed to change information that they felt did not represent their views and experiences. These follow-up checks from the respondent ensures that the researchers’ subjectivity do not dominate the findings (Patton, 2002, Holliday, 2007).

3.3. Findings and Discussions

This study has developed a generic framework for a sustainable research product commercialisation based on insights and experiences of the four selected academic researchers. As shown in Figure 3.1 below, there are eight elements for a sustainable research product commercialisation and these elements are interrelated to each other within a particular platform. These elements are: (i) knowledge, skills and personal traits of the researcher; (ii) creation of idea (iii) development, packaging and promotion of the research product (iv) commercialisation paths; (v) building competitive advantage in the market (vi) selecting a business partner (vii) nurturing relationship with business partner, and (viii) facilities and support.

![Fig.1 : A Framework for Sustainable Research Product Commercialisation](image)

3.3.1. Knowledge, Skills and Personality Traits of Researchers

Technical and entrepreneurial knowledge and skills are significant in attaining the success of commercialising of the research products, as agreed by all four academic researchers. These skills on scientific, technical and entrepreneurial skills are the skills that academic researchers must acquire in engaging of the research products commercialisation endeavour. Undoubtedly, academic researchers are well versed of their technical knowledge, however, they lack entrepreneurial skill. Entrepreneurial skill is a “must have” skill for academic researchers, and academic researchers need to acquire knowledge or skills beyond their scientific and technical skills as Professor J said that:

“You know, we need to master different aspects of management skills and management of R&D product is one of
them. All this while we probably know how to manage our research projects... You need to learn to manage that risk, and you need to learn other basic knowledge ... such as leadership etc. You need to learn marketing. How do you market your idea? How do you convince people your idea is good? How do you convince people to invest in your idea? So, all of these are beyond R&D. This is about the real life. ... In the real world, those are the skills that you need to make commercialisation a reality“.

On a similar stance, Professor F said that entrepreneurial skill is a bonus in commercialising research products in the university. Furthermore, the skills mentioned are significant especially when researchers encounter a situation that requires them to manage their research and team members effectively. All the four academic researchers agreed that these skills are not necessarily obtained or acquired through formal setting such publications or conferences per se, but they can be obtained through informal discussions with close friends or colleagues. Knowledge and skills are important and manage to set the criteria for researchers to be champion in research product commercialisation.

All of the four professors agreed that being disciplined and highly motivated in their behaviour and approaches contributed to the success for the research products commercialisation. Professor J stated that being highly motivated and strong willed meant that academic researchers are willing to sacrifice their time, money and energy. Furthermore, all of them agreed that researchers need to be confidence and possess strong belief that their products are both, technically good and commercially viable. They also believed that having a strong belief means that research should be conducted not merely for the sake of profit, but it should contributed to the benefit of the society as a whole as espoused by Professor F, and according to Professor K, this is where he achieved his utmost satisfaction being an academic.

Sound judgement is also plays significant role to set for a sustainable research products commercialisation among academics. It is because by following sound judgement, they agreed that they were able to control and keep track of their strategies for commercialisation. Thus, researchers need to swallow their ego, be humble upon criticism and avoid any negative assumptions, as suggested by Professor J.

Knowledge, skills and personality traits are vital to ensure that academic researchers to set for a sustainable commercialisation. This is because commercialisation of research products is not an easy tasks, it takes years for all of them to pursue for the research products commercialisation endeavour.

### 3.3.2. Creation of Idea

Idea generation or creation is the initial stage for research products commercialisation before they can be translated into a prototype, and seeking protection through IPRs and finally entering into the market place. However, the most critical part faced by academic researchers lies in translating this idea into a market place. All the them agreed that it is essential to have research products that have commercial values and suggested for other researchers to create products that have strong market value. Professor J and F especially highlighted that creating and inventing cutting edge product enhance with unique features does not guarantee that the product will have commercial value. Professor F observed that:

“As a researcher, we should always bear in mind that the best invention does not mean that it is also the best product in the market. The major difference is the so-called “best” product may not necessary stand a great potential in solving the underlying problems in the market”.

Thus, what is important that research products should function to solve a particular market problem and has a strong market demand. It is also important to note that to conceptualise research products in relation to the information drawn directly from the market environment. The market demand should be identified at the initial stage of conducting research that resulted a systematic generation of ideas. In order to achieve a systematic generation of ideas, it is better to conduct market analysis, as stated by Professor K and Professor J, and for Professor F he suggested to scan current condition of the market environment. Thus, by scanning and analysing the market
environment, academic researchers will be able to identify the:

- existing problems in the market;
- application and demand of the product in the markets;
- target market segment and areas of potential market growth;
- ecosystem of the industry and the position of the product within its ecosystem;
- potential end-users and buyers of the research products.

Market analysis helps researchers to identify research products with strong market values. This was observed by Professor K where he stated that conducting market analysis permits researchers to have a bigger view of the research products in relation to other products within its ecosystem. Hence it benefits academic researchers to identify potential buyers at the early stage of product commercialisation, and it can reduce failures in commercialising the research products. However, it is interesting to note that, rather than adopting a normal approach of conducting research that focuses on conceptualising a particular product, Professor H adopted reverse engineering approach – i.e. to begin with identifying a particular product demanded in the market and then work backward to develop a prototype. This approach is also significant to ensure that the products have a promising in the market place. The initial product development can assist researchers to decide which path of commercialisation that suits them most.

3.3.3. Paths for Commercialization

This study found that there is no one size fits all approaches for commercialising research products. It depends on the types of research products and goals of the researchers themselves. In this study, all four professors have adopted different paths for commercialising their research products. The path for commercialisation should be identified and set up at the beginning of the research and development (R&D) to ensure that the process is in the right track, according to Professor J who has fostered a Cohesive Action Plan. He said that, because R&D is always uncertain, researchers should anticipate to re-align their products with their strategy. Professor F, on the other hand, has adopted a Conducive Eco-System Concept which means that in a tricky business like commercialisation, it requires longer process and involve more difficult tasks than pursuing study at the Master or PhD levels. Thus, one needs full dedication in terms of their time, energy and money for a successful research product commercialisation. Professor H stated that commercialisation should be treated holistically (Holistic Approach) - which means that it is not just about the technology alone but it also includes on how the process of commercialisation is managed. Professor K embraced a Systematic Approach by starting at the very beginning by initialising his cutting edge research project until the end by achieving a sustainable business.

All of four researchers in this study found that intellectual property rights are important tools for research product commercialisation. Trade mark is seen as extremely significant as compared to other rights for business purposes, which was highlighted by Professor K and J. Apart from trade mark, copyright is always seen as important for academic researchers in protecting their works, as agreed by all three professors, except Professor K.

There are different options for research products commercialisation including contractual agreement, licensing, assignment, joint venture and spin-off companies. Professor J fostered “Hybrid Model” by combining licensing and joint venture which benefits him to minimise the risk in securing capital for the purpose of product development. Licensing agreement is also important for academic researchers who face limited facilities and is effective for a certain period and profit gained will be shared between researchers, university and the other parties. Professor H preferred joint venture because it allowed him to be together with the company for the product development. Professor K preferred to have partnership to establish a start up company, especially to market specific types of products. He also developed a spin-off company where the direction of the company is more focused, and people confidence is developed towards of the company. Professor F adopted joint venture with international company outside university. He said that although the form of commercialisation is challenging and risky, the company has gained more bargaining power than the researchers, and he explained that normally through joint venture, ownership
will be transferred to the company, and the researchers will only receive certain percentage of money based on the contractual agreement agreed upon by parties.

This study identified four main paths of commercialisation including the assignment, licensing, joint venture, spin-off. Ownership is transferred through assignment to the buyer, and academic researchers may enjoy certain amount of profit agreed upon between them. For licensing, there is still an opportunity for researchers to make some improvements for the product development as licensing permitting the buyers to utilise the products for a certain period and the ownership is kept by the researchers or universities. Product development, marketing and sales of the product will be carried out by the business partner. For joint-venture and spin-off, researchers are expected to conduct product development, marketing and sales of the product as they work for a business.

3.3.4. Product Development, Packaging and Promotion

As mentioned above, product itself may not be important since it always change and undergoes different stages of transformation in product development. Thus, as emphasised by Professor J there is the need to set up a comprehensive and cohesive strategy that outline the process of producing and commercialising products. He said that:

“Once you have an idea to produce the product from R&D, then you will design the process of going there. So the product itself is not important. The process is important. If you do not have the product, then you will not design the process. You will do the research for the sake of doing research. You will fulfil whatever the trend of the demand or KPI [Key Performance Index] at that time. If the demand at the time is writing the final report, then you will focus your energy to produce the final report. If the demand at the time is to publish papers, then you will write papers. If the demand at that time is to have an intellectual property, then you will go for the intellectual property”.

Thus according to him, researchers should have a “cohesive action plan” to manage and execute their research products and to avoid potential problems in the future. He emphasised that the process and effort from R&D to produce a product and enter market place successfully is more important than the product itself. Since product changes over time and is always a dynamic process where new input, new ideas, new things are emerge, thus researchers need to re-align the strategy consistent with their aim to commercialise their research product. Similarly, Professor K viewed that at the early stage of research process, researchers need to contextualise the product. For him research development refers to a process of transferring findings into solutions to a particular problem. Seeking assistance of experts and the use of appropriate facilities such as relevant technology are seen as important elements for product development as emphasised by Professor F. Furthermore, Professor F stated that product as a total package means that researchers need to know other complementary accessories to address the market needs. There are instances where product itself cannot function as a standalone solution, but functions as a component in a package. However, admitting the limited expertise and facilities especially for Malaysian academic researchers face, this could be a challenging task although it may seem impossible.

Although product promotion is normally done by the business partner, academic researchers may indirectly promote their research products. Professor F, who has developed his research products through a conducive eco-system, has promoted his products through paper presentations and publications. Furthermore, to enhance the product promotion, researchers should take the opportunity of making high impact visits to local and international companies. The emphasised that the academic researchers should be part of the program for the product promotion by spending time together with business partner. This was also agreed by Professor H. On a different note, a full time businessman who used to be an academicians man like Professor K adopts a systematic marketing and sales approach related to the novelty of his research products.
3.3.5. Building Competitive Advantage in the Market

Researchers should position their R&D products towards becoming a leading product in the market to have a competitive advantage for a sustainable business initiative. Identifying the competitive advantage is important for R&D products to ensure the successful commercialisation. Porter’s (1998) developed framework on how to evaluate competitive strength of R&D products which include: identifying the threats of new entrants; the threat of substitute products; the bargaining powers of buyers; the bargaining power of suppliers and rivalry among competitors. This framework may set as a guideline for academic researchers to evaluate their competitive strength of R&D products for a sustainable business arrangement, and to collaborate with business partner. Thus, it is important for academic researchers to acknowledge that there are numbers of similar products available in the market similar to their products. They must evaluate competitive advantage of the products in relation to similar products existing in the market. By this, academic researchers may identify their competitive advantage in relation to other existing products and work towards improving his research products. Professor K advised that if researchers who are just beginning to embark their research product commercialisation, it is advisable to focus on local market, before penetrating the international market, which is more challenging market.

3.3.6. Selecting Suitable Business Partner

In order to have a common goal, selecting a business partner needs to be done more carefully. This is because researchers and their business partners are two different worlds. Among many failures for research products commercialisation are because the conflicting understanding between both parties. In this respect, the trust should be developed at the early stage of commercialisation activity. Conflicts and differences should be avoided as they may disrupt the effort to achieve success. The four academic researchers proved to have individual strategy when selecting a suitable business partner. Applying a very objective approach, Professor J for example has developed his own checklist criteria a of business partner, to identify whether the business partner has knowledge on the target market, product, the current market demand and the skills of marketing and sales. Professor H adopted a subjective approach by relying on his own inner-senses and his past experiences especially while dealing with industry people. He spent time together with business partner to immerse in the real business world. Both of Professor J and H stated that analysing the profile of the company and talking to people in the area is another approach to be taken before making any decision.

Finding business people through networking is also useful for research products commercialisation. Four of them agreed that academic researchers need to consult prominent people in the industry and those who have connections and with higher positions or key players in the ecosystem because these are the people who can identify potential buyers or business partner as they are familiar with technology and its eco-system. Business partner also can be introduced by friends or colleagues, as exemplar by Professor H particularly he highlighted that in most cases, his business partner were introduced by his circles of friends. Thus, building good rapport with friends and colleagues because they can become your introducers to the outsiders. Furthermore, Professor F emphasised to make contacts with SME entrepreneurs rather than rich and large companies because big sized companies rarely able to entertain the small-scaled research products.

3.3.7. Nurturing Healthy Relationship with Business Partner

Full commitment is required to nurture the healthy relationship between academic researchers and business partners. They need to combine both expertises – whereby academic researchers need to have expertise from business partner in providing them with marketing strategies knowledge, and business partner needs the technical expertise from researchers to refine the functionality of the products. In many instances for a successful research products commercialisation, all the four researchers highlighted that there is a need for a healthy relationship.
Professor J described the importance of maintaining a good relationship and nurturing this relationship. He recognised the dynamism of relationship between two worlds, and stressed that the need to manoeuvre and steer the relationship to achieve the agreed goal between them.

This study recognised that building a good rapport with business partner would be developed based on trust and respect of people, which is not an overnight task. Good rapport helps each other to have a comfortable working environment. Academic researchers are encouraged to be adaptable to different environment that they encountered. Both parties need to be transparent and fairness specially related to decision making process. Any arising issues and any decision related to profit sharing should be done fairly in the meeting, as claimed by Professor J. Both parties are also need to be patient, understand each other’s interests and be emphatic with each other’s problems and limitations.

Based on experiences and insight of the successful academic researchers, there are several qualities need to be taken into consideration to foster healthy relationship, these qualities are:

- knowing your rights and responsibilities
- developing trust and respect
- exercising the practice of transparency and fairness
- being patient, understanding and emphatic
- practising good rapport
- being adaptable

3.3.8. Facilities and Supports

There are many supports available for academic researchers to pursue for commercialisation including IP policy. IP policies that is significant to support for research products commercialisation in Malaysia is the IP Commercialisation Policy for R&D Projects Funded by the Government of Malaysia under the Ministry of Science, Technology and Innovation (MOSTI). The main objectives of this policy is to regulate ownership rights of IP, management of IP, promote and facilitate the exploitation and commercialisation of IP especially funded by the government budget. Although IP policy is in place to promote and to assist researchers for commercialisation, however, Professor J said that it should be implemented in a conducive environment. Interestingly to note, Professor F suggested to revise IP policy where ownership is concerned, he said that: “the IP policy is quite in place. However, some policies need to be revised because if the industry is willing to spend the money, the IP will belong to them”.

The purpose of IP policy is to regulate for the management, protection and exploitation of IPs in the universities. Some universities might have their own IP policy. Nonetheless, ownership issue is always perceived as critical, especially relevant for team of researchers, and different fund providers which require meticulous negotiations to be placed in the planning. University also plays role in supporting for commercialisation activities including facilities, trainings, and management. Although universities provide those types of supports, but according to Professor J, “it could be better”. Incentives or rewards should be recognised and encouraged and to be regarded the best ways to support for research product commercialisation initiatives. A dedicated office or one-stop centre must be set up to assist for commercialisation. However, Professor H reminded that researchers should not always expect to receive a lot of external support, instead they have to make their own initiative to success. He suggested that the university should appoint a creative manager to manage activities related to product commercialisation. At best, this personnel should have a strong business acumen.

4. Conclusion

In conclusion, commercialising of research products is a complex process. As demonstrated by the four researchers, commercialisation is a challenging, risky and complicated task, although it is not impossible to achieve. Based on an analysis of their experiences, there are common elements that contribute to the success of research
product commercialisation. These elements are presented as the framework for effective strategies of a sustainable commercialisation of research products. This framework comprises of eight elements that need to be considered when aiming for commercialising research products. These elements are viewed as dependable and interrelated to each other and each element needs to be considered equally. Rather than suggesting for a specific framework, this study suggests for a generic and dynamic framework indicating that it can be applied on a different types of research products at different contexts of commercialisation. Moreover, the features of each element differ depending on the way in which research product is commercialised.

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