

Strategies to Enhance Commercialisation Activity: Researcher Perspective

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ABSTRACT

Commercialisation is a platform to recognise the findings of local researchers and develop the reputation of local universities in Malaysia. The purpose of this research study is to gain the perspective of researchers on the factors that facilitate and motivate research commercialisation activity. This study is limited in the setting of Malaysian private university. The study uses quantitative method incorporating questions that is based on a research model developed by the authors. Survey was deployed to the researchers in order to gain their feedbacks and opinion on strategies for commercialisation. The study discovered factors that contribute to the success and failure of product commercialisation in a university setting. In general, majority respondents with more than 80% strongly agree on the need of good marketing and overcome marketing strategy issues highlighted are critical factors that hinders success in commercialisation. Respondents also acknowledged the delineated factors that could enhance commercialisation and the need of professional productivity with 64% and 67% votes respectively. In conclusion, the key issues and challenges in commercialisation by researchers and managing university-industry technology transfer are identified and validated through the responses. These findings are anticipated to equip students, researchers and academia to strategise based on the factors that may impede research commercialisation. Furthermore, commercialization technology could be translated into sales revenue, additional profit, and job creation as tangible item.

Keywords: technology; transfer; commercialisation, enhance; researcher.

I INTRODUCTION

Recently, research commercialisation in universities has become one of the crucial factors that drives the economic and national development, where it was involved in several stages to establish new products,

knowledge and expertise in innovation. Malaysia and several other developing countries tend to develop new product based on economic demand through the universities' Research and Development (R&D) activities as source of economic growth.

Commercialisation is a process to transform research knowledge to new and improved features of products or services to secure market potential (Ismail & Mohamed, 2016). Current business services and research institutes are facing hostility from clients to pull-off the economic growth (Mueller, 2006).

According to the New Straits Times newspaper by Mustafa (2019), the benefits are numerous via the enhancement of research and innovation through joint research project, delivery of innovative commercial product, improvise teaching style, and learning and enrichment of students' knowledge. Academic researchers get to collaborate with industry to take their research products to another level of commercialisation. For example, a university which has expertise in semiconductor field that plans to produce graduates for electronic industry, will need to engage with a specific company through collaborative project. Thus, the company shall be able to provide financial support by covering the cost of facilities and laboratories. In summary, engagement between university-industry is important to boost innovation performance and increase the market competitiveness (Freitas et al., 2013).

Collaboration between university-industry usually have different modes. The five types of modes engagement between university and industry in Malaysia shows their effectiveness to the objectives of collaboration (Markman et al., 2008).

- Expertise exchange
- Research and Development (R&D)
- Training of firm employee
- Consultation work
- Product commercialisation

Furthermore, it is crucial to understand the market orientation to secure success in the R&D commercialisation activity. The constructs of market orientation were identified as customer orientation, inter-functional coordination and competitor orientation (Chang et al., 1998). This concept of market orientation was later incorporated into R&D commercialisation studies as researchers endorse the need of the inventions to marketplace.

Some studies reported that strategic market orientation is a successful factor in R&D commercialisation activities (Kadir et al., 2019; Tam et al., 2019; Kamaruddin et al., 2013). Universities have developed the market strategies by producing technologies industry to produce more product to fulfil market potential for more successful in sectors commercializing (Kadir et al., 2017).

II METHODOLOGY

This study will be focusing on the third domain in Figure 1 which is the researcher perspective on productivity, marketing strategy, factors that hinders and contributes to successful commercialisation.

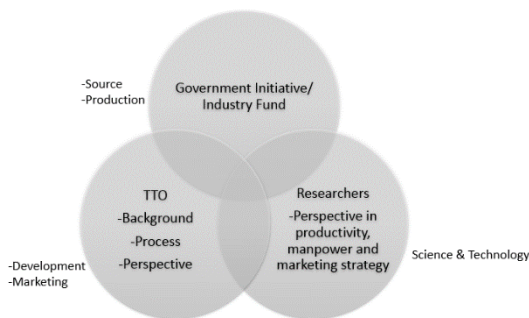


Figure 1.: Research model developed by authors for the commercialisation study.

The model is created as a guide for university-industry and technology transfer office, as well as highlighting the need to have the government support to enhance the collaboration and research study in Malaysia's academic setting. This model is utilised as a tool of communication in the academic setting.

The interaction between these three parties will provide the impact in achieving the goal of research commercialisation study in Malaysian university. Currently, the government has exercised policies and provide opportunities in the form of grants to enhance commercialisation activities in research institutions.

On the other hand, technology transfer office is responsible to guide academic research in developing new research study according to protocols, whether for intellectual property (IP), licensing, patenting benchmarking, copyrighting and writing commercialisation proposal. This eventually contributes to advancement of science and technology in the country. This study analyses four elements that provide impact to the research commercialisation activity in Malaysian universities. The survey was designed based on massive literature review from previous research studies and tailored to suit with the environment of the academic institutions in Malaysia.

Thus, the data obtained from this study are further analysed to obtain clarity on the current setting in research commercialisation. There are four sections designed in the survey for the researchers:

- i. Professional productivity and commercialisation perspectives
- ii. Impediments to research commercialisation
- iii. Factors that could enhance research commercialisation
- iv. Initiatives related to the marketing strategy

All valid responses were collected, and the data were analysed to conduct a descriptive analysis. Questionnaire for researchers consists of four sections that are represented in Likert-scale format. Based on the demographic profile of the respondents, 60% of them are Senior Lecturer and Lecturer with doctorate, 20% of them are Professor, 10% of them are Associate Professor and the last 10% are Lecturer without doctorate from different research institutes.

The graphical distribution on the type of research by the respondents of this survey is in Figure 2. Half of the respondents reported their research experience as Basic research (fundamentally curiosity-driven research), while another 40% conducted their research as Applied Research (the relationship and applicability of theories or principles to the solution of a problem) and the remaining 10% are involved in Translational research (new information or knowledge that is created in one area to another application).

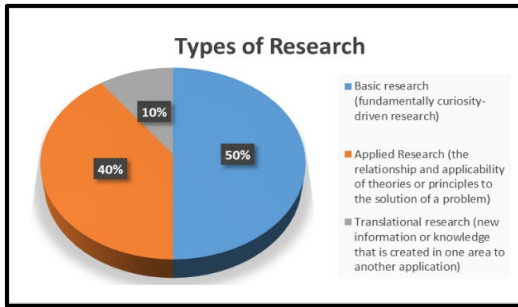


Figure 2.: Types of research by respondents in this study.

III RESULTS AND DISCUSSION

Prior to the questions on factors of research commercialisation, researchers were provided with six questions on their opinions regarding their current research goal and their professional productivity. On another note, the questions were designed to encourage awareness and motivation to commercialise among the researchers, regardless of their research profile. Table 1 indicate the mean response for each question in the first section.

Table 1.: Descriptive analysis for true-false questionnaire of professional productivity and commercialisation perspective.

Question Text	Mean		Standard Deviation
	Statistics	Standard error	
[Do you feel that your research results are sufficiently utilised through the generation of publications, grants, and other forms of professional productivity?]	0.7 (True)	0.153	0.483
[Do you intend to commercialise your research in the future?]	0.9 (True)	0.100	0.3162
[Do you think research commercialisation is important to promote within an academic setting?]	0.7 (True)	0.153	0.483
[Do you think the university places an emphasis on research commercialisation to department?]	0.3 (False)	0.153	0.483

[Do you think your research field places an emphasis on research commercialisation?]	0.6 (True)	0.163	0.516
[Does your research project give benefits to community, industries and government agencies?]	0.8 (True)	0.133	0.422

By carefully examining the data, it is found that 70% of the private university researchers agreed that their research fields, engineering and sciences, do place the need of research commercialisation. After rigorous examination, it was found that 90% of the respondents are interested to commercialise their research. While there is a low percentage of 30% who agreed that the university has vision in commercialisation activity, however, majority of the researchers disagreed that there is an emphasis on technology inventions in their current department. In summary, there is a varying set of results that consists of a similar percentage, which is 80% for both outputs, and one of them strongly support the importance of promoting research commercialisation among researchers within an academic setting and the benefits of inventions to the community, industries, and government. The next three sections further discuss on impediments and strategies for successful research commercialisation.

A. Impediments to research commercialisation

The research and development challenges are broad with competency as one of the main factors which refers to both entrepreneurs and academic personnel that have not reached the level required in business and technical commercialisation skills in order to successfully market the research output. There are other common issues that lead to impediments in commercialisation activities such as lack of linkages between government agencies, lack of expertise amongst government agencies, no policies and regulations, lack of manpower and lack of support in terms of funds as stated by Ee Shiang & Nagaraj (2011). On another note by Ajagbe et al. (2015), there is a lack of knowledge in the market, difficulties in finding the industry partner, lack of facilities (e.g.: equipment, machine), lack of communication with research institutions (SIRIM, FRIM, universities) and costly in innovation.

This section discusses the issues and impediment factors experienced by the researchers before entering the commercialisation process. Table 2 shows the descriptive analysis summary for each question in this section which is represented in Likert-scale format with statistical values.

Table 2.: Descriptive analysis for Likert-scale questionnaire of impediments to research commercialisation.

Question Text	Mean		Standard Deviation
	Statistics	Standard error	
[There are no barriers to commercialising research at the university.]	2.7 (Disagree)	0.3	0.949
[There is unwanted risk associated with research commercialisation.]	3.8 (Agree)	0.2	0.632
[I lack the expendable time.]	4 (Agree)	0.258	0.816
[There is excessive expense.]	3.5 (Agree)	0.342	1.080
[There is a lack of investors.]	3.8 (Agree)	0.291	0.919
[There is a lack of infrastructure including facilities and staff to help in the commercialisation process.]	4.2 (Agree)	0.327	1.033
[Unsupportive University policies, procedures and/or regulations.]	3.8 (Agree)	0.359	1.135

[Unsupportive federal policies, procedures and/or regulations.]	3.1 (Neutral)	0.233	0.738
[There is a lack of industry partners.]	3.3 (Neutral)	0.300	0.949
[Limited or no commercial application of my research exists.]	2.4 (Disagree)	0.427	1.310
[There is a lack of importance to academic.]	2.8 (Neutral)	0.416	1.317
[There is a lack of importance to my field.]	2.1 (Disagree)	0.277	0.876
[There is a lack of benefit to society.]	1.9 (Disagree)	0.379	1.197
[Lack of interest on R&D commercialisation.]	2.4 (Disagree)	0.371	1.174

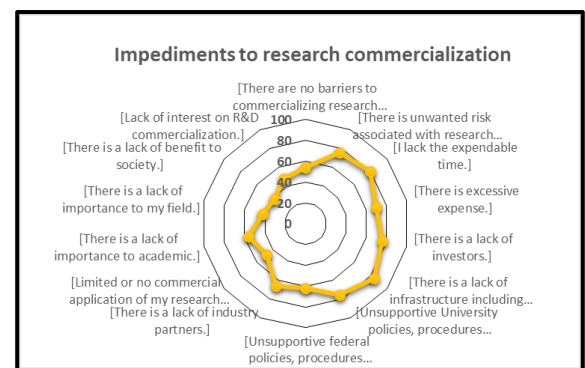


Figure 3.: Spider plot on impediments to research commercialisation.

Based on Figure 3, it is clearly seen that most of the researchers faced several challenges on commercialisation activities in university. A high percentage of 84% respondents highlighted the lack of infrastructure including facilities and competency

of staff. After rigorous review of the dataset, it was discovered that 76% voted the presence of unwanted risk linked with research commercialisation and innovation as a contributing factor. Additionally, other impediments highly agreed by the respondents are the lack of industry partners to commercialise their products and unsupportive university policies and regulations. Among the respondents' personal opinions are regarding the university and federal policies, as the researchers do not have adequate information on the present policies and the policies are not made known.

Razak and Saad (2007) highlighted the difficulties envisioned by universities are in finding the right industrial partners and rigid regulations and terms. This is reflected in the findings where 48% of the respondents agreed that the application to commercialise the product is limited, while another 38% agreed that there are no benefits to the end-users. Only few respondents showed a lack of interest on commercialisation activities as they are seeking for clarity in research directions of their capability to contribute in technology transfer area.

B. Factors that enhance research commercialisation

This section discusses on researcher motivational factors that could stir intrinsic motivation for research commercialisation in terms of time, information, financial aids, facilities and policies.

Some researchers have stated that university plays an effective role in promoting commercialisation activities in terms of facilities, management and training (Ismail et al., 2016). Table 3 reported the summary response for factors that could enhance research commercialisation activity. Based on the results, all of them agreed the function of the research management centre to help commercialisation process. Majority respondents with 82% agreed with the need to have subscription protected time in order to enhance commercialisation activities. This finding complements with Vanderford et al. (2015) that highlighted the importance of having a protective time.

Table 3.: Descriptive analysis for Likert-scale question of factors that could enhance research commercialisation.

Question Text	Mean		Standard Deviation
	Statistics	Standard error	Statistics
[Offering protected time specifically for commercialisation activities.]	4.1 (Agree)	0.277	0.876
[Information on how to commercialize.]	3.9 (Agree)	0.314	0.994
[Increasing financial support.]	4 (Agree)	0.394	1.247
[More infrastructure including facilities and staff to help in the commercialisation process.]	4.5 (Strongly Agree)	0.224	0.707
[Amend university policies, procedures and/or regulations.]	3.9 (Agree)	0.277	0.876
[Amend federal policies, procedures and/or regulations.]	3.3 (Neutral)	0.213	0.675
[Enhances links to industry.]	4.3 (Agree)	0.213	0.675
[Increasing emphasis placed by academia and/or my research field on the importance of research commercialisation.]	3.7 (Agree)	0.335	1.059
[Greater personal benefits including more royalty pay.]	4.3 (Agree)	0.260	0.823
[Greater societal benefits.]	4.3 (Agree)	0.260	0.823
[Nothing would help.]	2.3 (Disagree)	0.300	0.949

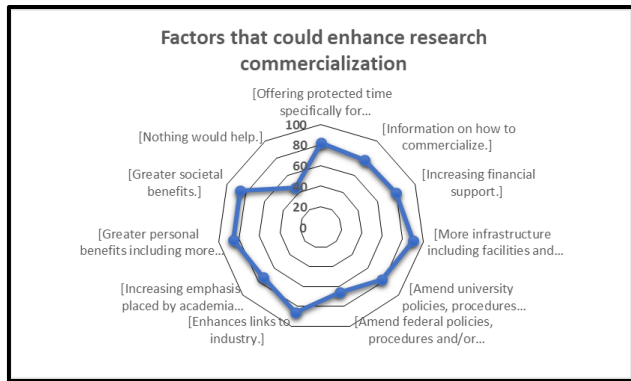


Figure 4.: Spider plot on factors that could enhance research commercialisation.

Based on Figure 4, 80% agreed that financial support from government and private sector should be increased to overcome the difficulties to search for collaborators with industry. Usually universities require huge investment at early stage of commercialisation to attract collaborator (Ismail et al., 2016). On another note, having conducive facility to conduct research study is quite important to the academia to develop their research commercialisation. Most of the respondents which is 78% agreed with the point of information on how to commercialize the product. Hartono et al. (2019) clearly stated that information on new technologies is crucial to achieve innovation sales on products.

Next, 78% seek for amendment of university policies, procedures and/or regulations and 66% seek for amendment of federal policies, procedures and/or regulations. The researchers in this private university suggested that if the royalties paid to the inventors is higher than the present allocation, it would boost research commercialisation activity. On the other hand, 86% of respondent agreed with notable distinctive personal benefits including more royalty pay seems imperious by universities to have a conventional reward system to the researchers (Yaakub et al., 2011). Last but not least, 86% of respondents agreed with the point on the capability of the product to provide societal benefits is one of the successful factors for commercialisation.

C. Initiative related to marketing strategy

There have been numerous studies investigated on the factors that contribute to the success of new product development (Connell et al., 2001; Sidek et al., 2014). Key success factors for new product

development process are cross-functional teams, management support and supportive organizational structure (Schimmoeller, 2010).

According to Tidd et al. (2001), market knowledge is crucial for those who wants to start a business. Pre-development preparation including initial screening, market assessment, preliminary market appraisal, business and financial analysis are vital. Innovator must empower the needs of assessment before starting any business to avoid failure in commercialisation. Significant part in the market analysis is competitive analysis.

This section further discusses on initiatives that are able to deliver marketing strategies successfully and communication tool to reach potential consumer. Table 4 indicate the list of mean response for each question in the marketing strategy section.

Table 4.: Descriptive analysis for Likert-scale question of initiative related to the marketing strategy.

Question Text	Mean		Standard Deviation
	Statistic s	Standar d error	Statistics
[Realign research commercialisation and product (package and promotion).]	4.1 (Agree)	0.180	0.568
[Innovation development centre and effective support group to conduct product development.]	4.0 (Agree)	0.211	0.667
[Market analysis should be given a priority at the beginning (market potential, market needs and research product).]	4.0 (Agree)	0.211	0.667



Figure 5.: Spider plot on initiative related to the marketing strategy.

Based on Figure 5, 88% of the researchers agreed that market analysis before commercialisation of a product is deemed crucial. Next, 82% had agreed the need of realignment research commercialisation and product (package and promotion) to achieve product sales target. On another hand, 80% respondents highlight the need of innovation development centre and effective support group to conduct product development. However, 20% respondents provide suggestions to improve strategy to the market through collaboration between support group with researcher to promote product to market.

According to the respondent's experience, software and system engineering has difficulty in finding industry partner, due to high number of companies originated from US, Japan and Europe. These companies do open branches worldwide, but most are resellers.

The development of new products to the markets involves high risks. Companies with good business knowledge and strong production need to enter a market to exploit their capabilities to advanced heights. Therefore, new product development is a malleable subject that provides a company the ability to adapt with any changes in the marketing environment and to yield a competitive advantage (Goulding, 1983). Improvements to existing products may improve performance or greatly discern values from old products. This product type can represent up to 26% of all new products introduced in the market for commercialisation. Imitative of existing products are known as new items added to the product line which fit within the existing product manufactures that are already entered the marketplace with new add-on features (Owens, 2009).

For commercialisation, researchers need to have the opportunity to engage with foreign developers as some research area could not secure local developers that have the expertise or resources to commercialize projects in local universities. There are open-source communities that researchers can collaborate, however, the outcome will be an open-source software, which may not be considered as commercialisation. For software, the definition of commercialisation was suggested to redefine by including open source as long as there are users for the open-source software.

D. Summary

In summary, Table 5 presents the reliability studies of the measurement scales. The Cronbach's alpha coefficients were calculated in SPSS. The Likert scales show the highest alpha value at 0.890 for initiatives related to marketing strategy while the impediments to research commercialisation at 0.708. The Cronbach's alpha values are shown to be 0.708 and above, the variables distributed in this study showed a high of consistency thus meeting the reliability assessment.

Table 5.: Reliability Statistics

Variables	Cronbach's Alpha	Internal Consistency
Impediments to research commercialisation	0.752	Fair
Impediments to research commercialisation	0.708	Fair
Factors that could enhance research commercialisation	0.592	Poor
Initiatives related to marketing strategy	0.890	Good

IV CONCLUSION

The study presented has investigated the opinion of researchers and motivation factors to participate in the research commercialisation process of a private university. Researchers provide feedbacks on the importance to market their ideas and secure the attention of industry player in order to collaborate and

progress in research development. In conclusion, securing a partner industry player, and marketing strategy with facilities and support from institute contributes to encourage participation in commercialisation. These findings are hoped to prepare researchers and institute to strategise based on factors that may enhance research commercialisation. Further study is recommended to promote on know-how to conduct successful marketing strategy for researchers.

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