

Market-Oriented R&D Commercialization at Research Universities in Malaysia – Insights from Selected Cases

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Abstract:

Market-Oriented R&D Commercialization Framework (MO-R&D-CF) was used to assess four cases of successful R&D commercialization at three Research Universities in Malaysia. All four exhibited the ability to identify and qualify existing or latent needs of their prospective customers by means of developing and testing specific product or system prototypes in iterative manner with prospective customers: (1) in the case of the non-steroid eczema cream (REMDII), the prototype product was made available to members of Malaysia Eczema Support Community and the feedback from users was used for further clinical trials to validate the product; (2) in the case of customized prosthetics and orthotics services (BioApps), a full laboratory facility to measure movements, walking profiles, foot pressures, etc. was used to develop customized prototypes that were tested by ready patients at the university hospital; (3) in the case of the fitness, wellness and healthy living solutions provider (UMCH Technology), need qualification was done by means of a pilot project using the prototype system with one of the industry players; and (4) in the case of Primera Red Rice, it was developed to ride on the trend for healthy lifestyle, specifically in addressing the issue of obesity and diabetics among consumers in Malaysia. All four cases clearly indicated the iterative nature of the various stages of MO-R&D-CF as well as the need to work closely with prospective customers and relevant stakeholders before commercial scaling up.

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I. INTRODUCTION

R&D commercialization at institutions of higher learning, especially universities, has come under greater scrutiny in the last two decades [1, 2]. Some scholars argued that universities have a key role in economic development [3]. The topic on academic entrepreneurship has become ever more relevant recently [4]. At the same time, despite the calls for closer academic-industry collaboration in terms of research and commercialization there seem to be lingering issues that need to be addressed [5]. R&D commercialization is also becoming critical in emerging economies (see for examples [6, 7]). In the case of Malaysian public universities, the need to commercialize R&D is even more critical since the budget for all public universities have been reduced by as much as 30% since 2016, thus putting a lot of pressure on getting returns from the money spent on R&D.

A longitudinal study of 50 university spin-off (USO's) companies from Uppsala University, Sweden, over nineteen years was conducted to determine specific factors that increased their success rates [8]. From the study two major barriers to overcome for a USO during its development seem

to be a need for clear entrepreneurial commitment in the founding team of researchers and to overcome the so-called 'threshold of credibility'. The latter corresponds to the challenge for a new venture to be accepted and embedded in the existing business network, which is crucial to be able to reach sustainable returns.

While there are many factors that contribute to the success of USO's, such as novelty of the technology or product, timing of market entry, competitive landscape, access to funding, entrepreneurial flair of the scientist-founder, etc., market and marketing considerations are acknowledged to be as important (see for examples [9, 10]. Baharudin and Mohd Farid [11] proposed the essential elements of market-oriented R&D commercialization framework in the context of research universities and government research institutes in Malaysia.

II. MARKET-ORIENTED R&D COMMERCIALIZATION FRAMEWORK

The market-oriented R&D commercialization framework is given in Fig. 1. This will be used to assess four selected cases of successful market-oriented R&D commercialization at three research universities in Malaysia, namely, Universiti

Putra Malaysia (UPM), Universiti Malaya (UM) and Universiti Kebangsaan Malaysia (UKM). The focus is on identifying market needs (expressed or latent) and qualifying them at each of the major phases of R&D commercialization, i.e., Phase 1-R&D Activities & Technology Platform, Phase 2-Prototype Development, Phase 3-Scaling-Up (Pilot) and Phase 4-Commercial Start-Up. At the commercial start-up phase, fulfillment of market needs is achieved through growth and diffusion in the market place by means of 5 business thrusts:

- (1) Developing and delivering a qualified value proposition to the target market
- (2) The right balance of cost-structure and profit potential
- (3) Appropriate production facilities and securing the right resources
- (4) Developing optimal revenue model and complementary assets
- (5) Expanding partners' network

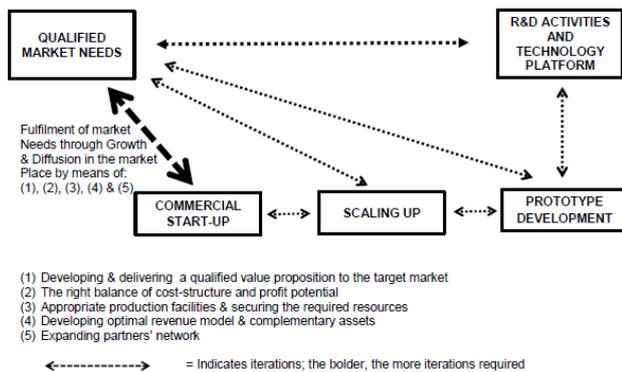


Fig. 1 Essential Elements of Market-Oriented R&D Commercialization

III. CASES AND DISCUSSION

Case 1: REMDII

Phases 1, 2 and 3 were implemented iteratively in the case of REMDII. The qualification of market needs was constantly made while developing the technology platform, i.e. treatment to minimize eczema symptoms were done iteratively by incorporating feedback from users while REMDII was being formulated. This iterative process enabled fine tuning of the formulation to effectively address the eczema symptoms.

Market needs qualification was made by means of samples of REMDII sent to eczema sufferers to try and share their experiences of using it via a dedicated Facebook group called Malaysia Eczema Support Group; through this FB Professor Lai and her team managed to get invaluable feedback on the efficacy of REMDII formulation. Scaling-up was done at the laboratory and facility at UPM's Science Park.

The company Lipidware Sdn. Bhd. was set up in 2016 to commercialize REMDII line of products and they are made available in more than 50 selected pharmacies in and around Kuala Lumpur and online through online portals such as Lazada and Shopee as well as REMDII's own online e-commerce Website.

As of 2019, Lipidware is at the early Commercial Start-Up

Phase fast fulfilling several of the five business thrusts: (1) It has qualified REMDII's value proposition of natural, non-steroid-based, clinically proven cream that can effectively reduce eczema symptoms; (2) It has secured investment for commercial production facilities; (3) It has expanded distribution networks through selected pharmacies as well as online.

Equally important it has in place a core team consisting of Professor Dr. Lai herself as the founder and Chief Scientist with able key management members: Head of Research & Development, Head of Project and Head of Finance & Operations. Marketing campaigns are made through social media as well as the PR Department of UPM.

The major challenges of the company now are: (1) striking the right balance of cost-structure and profit potential, and (2) developing the optimal revenue model and complementary assets in order to move up the innovation diffusion curve into the mainstream domestic market. The regional and global market would be the next frontiers of growth for the company.

Case 2: BioApps Sdn. Bhd.

As with REMDII, Phases 1, 2 and 3 happened iteratively for BioApps. The basis for its market potential was the World Health Organization's estimation that 0.5% of the population of a developing country have a disability that will require a prosthesis or orthosis and related rehabilitation services. This prediction suggests that around 160,000 of Malaysia's current population of 32 million need prosthetic or orthotic (P&O) devices. The population is projected to reach 38.5 million by 2040, including approximately 200,000 individuals with a physical disability.

However, based on studies by the two researchers-founders of BioApps, Professor Ir. Dr. Noor Azuan Abu Osman and Professor Ir. Dr. Wan Abu Bakar Wan Abas, many of the patients who received their prostheses or orthoses did not get to use them on regular basis. The main reason being the prostheses or orthoses were uncomfortable to wear – these were produced mostly by people who did not have access to appropriate technology and were based on their own experience. Consequently substantial amount of monies paid by the Social Security Organization (SOCSSO) for prostheses and orthoses for disabled members were wasted.

There is thus, a real need for customized P&O's that fit well with the limbs of disabled persons so that they would be comfortable using them. This forms the basis for BioApps value proposition: BioApps will supply up-to-date prostheses (artificial limbs) and orthoses (assistive devices) towards proper rehabilitation of patients. Its products are based on advanced scientific research carried out at the University of Malaya's (UM) motion analysis laboratories. BioApps provides prosthetic, orthotic, and foot-care devices that patients enjoy wearing.

A full laboratory facility to measure movements, walking profiles and foot pressures, etc. of patients helps in the design and production of customized P&O's that offer optimum fitting for comfortable daily use.

Scaling-up for BioApps was made possible due to its being a UM's spin-off company. In January 2015, BioApps started

its operation at the Ground Floor, South Tower, Universiti of Malaya Medical Centre (UMMC) and now acts as the sole prosthetic and orthotic service provider for the UMMC.

These in-house ready patients provided the early business volumes that enabled BioApps to grow and have positive cash flows for expansion into a full-scale commercial business entity. Since 2018 the company has embarked on all of the five business thrusts of Phase 4 Commercial Start-Up, especially in expanding partners' network. The company currently has secured partnerships with major hospital chains as well other organizations in Malaysia and abroad. As of 2019 it has grown to a full scale business entity with 14 staffs headed by a General Manager, and a 3-members board of directors with 2 of them being the founders and shareholders.

The major challenges for the company at this stage are to find the right balance between cost structure and profit potential as well as developing optimal revenue model and complementary assets.

Potential for regional and international expansions bodes well for the company.

Case 3: UMCH Technology

Many insurance companies in Malaysia (as well in most parts of the world) incur substantial reduction in profits (or even suffer losses) due to ever-increasing number of claims by policy holders for various illnesses, including preventive ones. If the policy holders could be incentivised to keep healthier life, these companies could save a lot and at the same time, the policy holders could have better quality of life. The future of healthcare is for wellness and prevention versus sick care, currently.

UMCH Technology Sdn Bhd target customers are health insurance companies and medical service providers to provide customers or policy holders with programs and incentives to keep them healthy. UMCH value proposition states the following:

"The Company aspires to become the regional leader in providing highly relevant and effective fitness, wellness and healthy living solutions. We "re-engineer" ("disrupt" existing models) the healthcare delivery system by empowering the individual to take charge of their own health at home and link them up with preventive healthcare strategies from our panel of fitness and health professionals at an affordable cost. We are working on several innovative and pioneering solutions that integrate hardware, firmware, domain intelligence, big data management and healthy living needs into easily assessable, highly mobile and well integrated products."

UMCH Technology solution is called CHIEF: Connected Healthcare Integrated Fitness. Phase 2 involves the actual development of the Apps based on the target market needs assessment in Phase 1; this assessment was done internally by the researchers-founders. In Phase 2 the company came up with the features and functionalities of the App that would address the market needs internally based on input it received from one of the researchers-shareholders whose area of expertise is in family care medicine. The software part to complement this comes from another founder who is from the Department of Artificial Intelligence, Faculty of Computer

Science & Information Technology.

The first 5 modules of the Apps include: (1) Activity module; (2) Body module; (3) Food module; (4) Mind module; (5) Social and total health score modules. For Phase 3 Prototype Development, the App's features and functionalities were improved by incorporating feedback and information gained from a pilot project implemented with one major player in the health insurance sector in the country. Results from the pilot were encouraging, i.e. many of the participants have actually used the various features of the App and improved their health. Feedback from both users and the company are being used to fine tune the App. The information is also used to identify the users who fall in the "red zone" category that need to be closely monitored and incentivised to improve their health.

UMCH Technology presently is at the stage of commercial start-up – it has the following units/departments in place: (1) Board of Directors; (2) Core Management Team; (3) Development Team; (4) Research Team. Highlight of the main issue at this Phase as discussed with Mr. Teoh, CEO:

"The main challenge faced by UMCH Technology is the lack of go-to-market funding. As the product is a new innovative and disruptive technology, we need to spend more effort to create awareness, user education and market our product. It will also take a lot more effort in convincing interested investors on the potential future value of this innovation. We also faced company valuation problem as we do not have the past track record to support the future valuation".

Clearly UMCH Technology's product is new to the market and disruptive to the existing business model of the health care and health insurance industry which is based on sick care rather than preventive care. Thus, it will be more challenging to achieve commercial scaling up. The key is getting a corporate customer-cum-partner with enough business volume to show case the benefits of the solution. This would enable the company to implement and fine tune the 5 business thrusts of Phase 4 more effectively.

Case 4: Primera Red Rice

Primera Red Rice also known as UKMRC-9 has a low glycaemic index (GI) value which helps to reduce after meal blood sugar spikes. The anthocyanin in Primera Red Rice serves as good source of antioxidants, providing a healthy wholegrain option where rice is a staple food. This rice is therefore suitable for consumption by all, especially for diabetics, obese and health conscious people. The product meets the need of the consumer market in Malaysia considering that the country now has the highest obesity incidence in Asia. Closely related to this is the alarming rate of diabetes in Malaysia as well.

Moving from Phase 1-R&D Activities & Technology Platform (developing the right strain of rice with the desired traits) to Phase 2-Prototype Development, took a lot of efforts, resources and time in the context of Primera Red Rice – the company has to develop enough "breeder seeds" (with the six registered patents) into product quantities that can be grown in pilot plots (i.e. proof of concept stage); this was

secured by having pre-commercialization funding. The company then has to prove to the relevant agencies that it can produce “certified seeds” for farmers in enough quantities from field trials before full commercialization (this took about 3 years to complete going through various evaluation committees and agencies from 2015 to 2017). This stage consists of stringent processes and quality control to ensure farmers get the claimed yields.

The key factor at Stage 3-Scaling Up was to find the right industry collaborator – in this case the company engaged an industry consultant that has the necessary networks with the farmers who were willing to plant the rice with the right terms & conditions. This was accomplished through contract farming arrangement. Leveraging on the benefits of Primera Red Rice to address the current health concerns among Malaysian consumers has helped the company to get the product accepted into most of the major retailers in the country. At the same time a big challenge now is to create brand awareness of the product and market education. Interestingly the demand for the product is substantial in the Middle East but the company is facing regulatory issue with the authority for export which it hopes to resolve in due time. The major challenges faced by the company at Phase 4-Commercial Start-Up are: (1) finding the right balance of cost-structure and profit potential; (2) appropriate production facilities and securing the right resources; and, (3) developing optimal revenue model and complementary assets. (1), (2) and (3) will have to be worked out in the context of contract farming business model. (4) expanding partners’ network for the export market holds the key for the medium term since the demand for this product is substantial in the high income countries of the Middle East and the developed economies.

IV. CONCLUSION

All the university spin-off cases in this study indicate the importance of iteration at the early phases of R&D commercialization, i.e. at need qualification, R&D activities and technology or concept development as well as at the prototyping or proof of concept phases. The duration and complexity of the iteration are determined by the type and nature of the product or technology involved as well as its degree of “newness” to the market – in the case of REMDII the cycle is relatively short, 2 – 3 years from need qualification to commercial start-up; for Primera Red Rice on other hand, it took almost seven years from initial R&D activities to commercial start-up.

At the prototyping or proof of concept phase to scaling-up and commercial start-up phases, key factors for success are getting the right institutional support including appropriate funding and access to ready captured market as well as the right industry partners. Of course for all these to happen, it goes without saying that the researcher-founders of the spin-offs would need to have the right entrepreneurial mind set and traits, especially in managing and mitigating the risks involved and navigating the often-challenging internal procedures and policies of the universities. These cases proved that despite the inherent challenges in university spin-offs to R&D commercialization, successful businesses

could be developed by researchers with the right flair and determination.

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