Asia Pacific Business Innovation and Technology Management, Pattaya, Thailand

Knowledge Determinant in University Commercialization: A Case Study of Malaysia Public University

Low Hock Heng\textsuperscript{a}, Amran Md Rasli\textsuperscript{b}, Aslan Amat Senin\textsuperscript{c}

\textsuperscript{a}Universiti Teknologi Malaysia, Jabatan Pengurusan, Fakulti Pengurusan dan Pembangunan Sumber Manusia, 81310 Skudai, Johor, Malaysia

\textsuperscript{b}Universiti Teknologi Malaysia, Jabatan Pengurusan, Fakulti Pengurusan dan Pembangunan Sumber Manusia, 81310 Skudai, Johor, Malaysia

\textsuperscript{c}Universiti Teknologi Malaysia, Jabatan Pengurusan, Fakulti Pengurusan dan Pembangunan Sumber Manusia, 81310 Skudai, Johor, Malaysia

Abstract

Recent debate on university commercialization has drawn growing attention to the role university play as drivers to local economic growth. Studies related to knowledge determinant have assume that their presence would encourage greater commercialize activities. However, this is not always true. Past studies have also overlook the alignment of the type of knowledge required for successful commercialization with its audiences. We argued that knowledge did not directly influence entrepreneurial behaviour but rather the perception towards behaving entrepreneurially. Moreover, since the experience of academic researchers and entrepreneurs are different, the knowledge required for successful venture would be different. Thus, having the appropriate knowledge would then enhance innovators’ perceptions toward commercialization which manipulate their propensity to engage in this activity. This paper hopes to provide insight to the type of knowledge desired by interviewing the academic researchers and entrepreneurs in Malaysia universities as well as the impact of perceived feasibility on commercializing activities.

© 2012 Published by Elsevier Ltd. Selection and/or peer-review under responsibility of the Asia Pacific Business Innovation and Technology Management Society. Open access under CC BY-NC-ND license.

University commercialization; knowledge determinant; perceived feasibility

1. Introduction

Economists of late have regularly reminded their audiences that the disparities in countries productivity and growth are less reliant on their abundance of natural resources than the intellectual capacity and quality of human capital in the factors of production’s equation. In other words, creation of new knowledge and innovations and integrate them into people and/or equipment have become increasingly important for economic growth (Friedman, 2009)[1]. Universities being the traditional custodian of knowledge and intellectual accumulation have thus being increasingly entrusted with the responsibility of local economic contributor (Etzkowitz, 2003)[2]. Universities responded to this
challenge by engaging in entrepreneurial venture via vehicles such as industrial science park and incubation centres (Rothaermel et. al, 2007)[3], spin-offs centres (Swamidass and Vulasa, 2008)[4] and technology transfer offices (Harman and Harman, 2004)[5].

However, the success rate of universities commercialization has fall short of the initial expectation and excitement (Lehrer et al., 2009)[6]; even though the growth of patents application has been rather phenomenal (Berman, 2008)[7]. This means that the core idea of translating universities’ research and development (R&D) into marketable products and/or services has not yield the desired result. This is rather surprising given that universities with the plethora amount of accumulated knowledge gained especially from their superior R&D, industrial science parks and/or incubation centres’ setup; are not able to manage such a transition (Tseng, 2010)[33]. Perhaps what is lacking is that not all knowledge required for successful entrepreneurial venture are present (Muscio, 2009; Lettl et. al, 2009)[8],[9]. Hence, a study was conducted to identify the knowledge determinants that influence their perceptions toward commercialize.

This exploratory study thus allows us to expand the landscape of mechanism for technology transfer from academia to the market through the merging of the psychology and strategic realm of commercialization. Past entrepreneurial researches which overlook the influence of perceived feasibility on commercialization (Standish-Kuon, 2007; Tseng et al., 2011)[10], [32] and the necessary knowledge for successful entrepreneurial venture has created a vacuum in the university entrepreneurship’s literature. We hope to plug this deficiency through this exploration.

2. Perception and Behaviour

Until today, two views dictate the discussion related to perception and behaviour (Wang and Sun, 2008)[11]. The first assumes that the two constructs as compatible and equal both conceptually and operationally; and are thus used interchangeably (Mehta, 2000)[12]. The second which is a more popular views amongst scholar, contends that one’s perception precedes attitude (Wang and Sun, 2008)[11]. Taking a cue from the second perspective, earlier attempts have been made by scholars to explain the cognitive process in commercialization. Standish-Kuon (2007)[10], utilizes Azjen’s 1991 Theory of Planned Behaviour (TPB), to show a positive link between the perception of feasibility towards commercialization and the actual display of the behaviour. Kruger and colleagues (2000)[13] employing Shapero’s 1982 model of the Entrepreneurial Event (SEE) also reported the same finding. In view of this it is not unreasonable to admit the existence of a very strong and positive relationship between entrepreneurial behaviour and the perception of feasibility to commercialize.

3. Knowledge Ingredients in University Commercialization

The new economic philosophy of treating knowledge as one of the factors of production means that university systems are required to constantly evolve to accommodate economic demands as much as its traditional mandate of knowledge advancement. Meta-analysis of 152 articles related to university entrepreneurship by the authors suggested that various types of knowledge are essential for successful commercialization. Study by Muscio (2009)[8] and Moroz et. al. (2008)[14] at various universities indicated that commercialization of university products are often hampered by the lack of business management knowledge. In other words, while universities are highly accomplished in the technical arena, they lack business acumen.
The heart of commercialization is innovation. Innovation on the other hand demands reassemble of disparate and diverse technological knowledge into a novel fashion (Lettl et. al., 2009)[9]. Hence, the presence of knowledge exchange and depository centre is crucial. Successful innovators commonly utilize their respective community of peer specialists for this reason. These communities function as critic; filtering, selecting and suggesting promising ideas (Von Hippel, 2007)[15].

Inventors past evidence of commercialization is also seen as an important facet for commercialization. Seminal work by scholars found that established faculty or star scientists are more likely and successfully commercialize an invention due to the learning curve effect (Jain et al., 2009; Muscio, 2009)[16],[8]. Therefore, it would not be too far to assume that experienced innovators possessed the tacit knowledge needed for commercialization.

Often the evolution of laboratory inventions to marketable products does not occur in a frictionless manner. There exist extensive delay and failure due to the reorientation and reconfiguration process of an invention to tailor to the demands of the marketplace (Markman et. al, 2008)[17]. Hence, the knowledge and understanding of market trends and needs is crucial. This would overcome the “technology push” situation where inventors look for a market as oppose to “market pull” variant where market is crying for a new product (Swamidass and Vulasa, 2008. Wright et. al., 2008)[4],[18]. Often this knowledge resides with the practitioners rather than the academic researchers (Lindelof and Lofsten, 2004)[19].

Having sufficient and extensive industry network knowledge is also crucial for commercialization. Fiet (2007)[20] found that this knowledge allows potential inventors to pan through countless ideas before an invention worth commercialization is germinated.

4. Research Design

Due to the gap in the current literature related to effects of knowledge determinant on perception specifically perceived feasibility to commercialized case study was employed in this study. This follows Patton’s (1990)[21] proposition that the study of human behaviour and attitudes is best explore via case study. Moreover, the use of case study would also ensure that in depth perspectives which could provide convergent evidence on a particular issue being considered (Yin, 1994)[22]. Seigel et al. (2007)[23] recommended the use of case studies in the study of commercialization because it involves inter disciplinary and in depth analysis of the topic studied.

Multiple case studies were employed in the analysis to construct an initial topology of the various types of knowledge that influence academic researchers and entrepreneurs’ perception to commercialize. This method was preferred because it produces a more robust result (Eisenhardt and Graebner 2007)[24]. Eight cases at various stages of commercialization in three Malaysia Research University were studied. Structured interview was employed because it allows sufficient similarity from respondents to enable logical categorising and drawing of conclusions (Arora and Stoner, 2009)[25]. Interviewees consist of academic researchers and entrepreneurs being equally divided. Entrepreneurs in this study are made up of invited incubates working under the said universities’ incubation programs. Data collected was categorized based on the theme of the study i.e. the respondents’ recollection of the knowledge and process in their quest to commercialize their innovations.

5. Analysis
All of the respondents interviewed in this study acknowledged the positive influence of possessing sufficient knowledge with the perceived feasibility of engaging in commercialize activities. This is consistent with the proposition of the TPB(Ajzen, 2002)[26] and the SEE model which suggests that perception is antecedents to behaviour.

Theme analysis of the type of knowledge affecting perceived feasibility of academic researchers and entrepreneurs resulted in areas as describe in Table 1 and Table 2:

**Table 1: Knowledge Affecting Perceived Feasibility to Commercialize of Academic Researchers**

| Driver  | Description                                                                 | Count |
|---------|------------------------------------------------------------------------------|-------|
| Business| Possessing business related knowledge to complement technical knowledge and vice versa. | 4     |
| Market  | Know and understand the requirement of the market need.                       | 4     |
| Upscale | Having the knowledge to produce and test product from laboratory experience to a pilot plant and industrial scale | 3     |
| Diversity| Knowledge from different faculties harness together to provide sufficient feedback to enhance market valuation of a product. | 3     |

**Table 2: Knowledge Affecting Perceived Feasibility to Commercialize of Entrepreneurs**

| Driver  | Description                                                                 | Count |
|---------|------------------------------------------------------------------------------|-------|
| Protection| Sufficient knowledge to protect an invention effectively but within the allocated budget. | 4     |
| Networking | Possessing sufficient network and contacts to fine tune and analyze an invention for market worthiness. | 4     |
| Technical | Know and understand the technicalities of a product to align it to the trends and needs of the market. | 4     |
| Recency  | Inventors must possess the latest spectrum of knowledge in order to ensure inventions are sufficiently new | 3     |

Respondents were also asked to rank the importance of the types of knowledge required for successful commercialization with the lower rank denotes a more important contributor to commercialization endeavour. Result of the analysis is provided in Table 3. The high score of Kendall’s coefficient of concordance indicates a general agreement amongst respondents toward the importance of the different type of knowledge.

**Table 3: Agreement between Respondents**

| Academic Researcher | Mean Rank | Entrepreneur | Type of knowledge | Mean Rank |
|---------------------|-----------|--------------|-------------------|-----------|
| Business            | 1.25      | Protection   | 1.05              |           |
| Market              | 2.00      | Networking   | 2.25              |           |
| Upscale             | 2.75      | Technical    | 3.25              |           |
| Diversity           | 4.25      | Recency      | 4.20              |           |

**Test Statistics**

| N | 4 |
|---|---|

| N | 4 |
Results of these analyses indicated that though knowledge is an important ingredient to enhance perceived feasibility of inventors toward commercialization, they have different context on different audience.

6. Discussion

The need of knowledge input for successful commercialization is without doubt crucial. This situation is further reinforced by the result of this study where all respondents agreed that having sufficient knowledge will improve the perception of feasibility towards behaving entrepreneurially. This result resonance with the proposition of the TPB (Ajzen, 2002)[26] which proposes that perception influences behavioural feat. Moreover, the significant relationship between the two constructs is also consistent with reports by scholars (e.g. Wang and Sun, 2008; Holtzhausen and Fourie, 2009)[11],[27] though in different context. Hence, we conclude that perception of feasibility has a significant impact on the decision making of an academic researcher to commercialize.

While, knowledge determinant is necessary to accelerate commercialization, it must be tailored to the requirement of the inventors i.e. the academic researchers or entrepreneurs. Academic researchers reported the lack of business acumen and marketing as the two most important ingredients to improve their perception towards commercialization. This is hardly surprising given that academic researchers are not exposed to the working of the commercial world. Moreover, few universities are mechanically or organizationally set up to handle the solicitation, evaluation, protecting, marketing, licensing, and managing the post-commercializing operations of an intellectual property (Swamidass and Vulasa, 2008)[4].

Entrepreneurs on the other hand are driven by economic gains. This is consistent with Jain and colleagues (2009)[16] study which found that “an entrepreneurial orientation typically requires intense single-mindedness of effort, a short-term focus, and an emphasis on execution with products and profit representing the key outcomes” (p. 924). Hence, entrepreneur’s main consideration is the protection of his/her investment. This protection could be provided with the existence of an effective intellectual properties right (Linton et. al., 2008)[28]. However, having a full intellectual protection is costly. Hence, sufficient care must be taken to impose appropriate protection to an invention without sacrificing too many resources.

Results of this study also indicated the importance of merging the strength of academic researchers in the scientific and technical areas with industry’s business knowledge. The need for business related knowledge cited by academic researchers could be complemented by business practitioners. On the other hand, technicalities and up-to-date inventions as well as networking could be to a certain extend addressed by universities. Unfortunately, no suitable model or framework thus far has been developed to make this relationship efficient and successful (Worasinchai et. al.,2008; Wang and Lu, 2007)[29],[30]. This apparent lack of collaborative knowledge between universities and industries has resulted in

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Kendall's W}^a & .886 & \text{Kendall's W}^a & .836 \\
\text{Chi-Square} & 17.714 & \text{Chi-Square} & 16.714 \\
\text{df} & 5 & \text{df} & 5 \\
\text{Asymp. Sig.} & .003 & \text{Asymp. Sig.} & .005 \\
\hline
\end{array}
\]

\(a\). Kendall's Coefficient of Concordance
unsatisfactory collaborative effort between those two entities thus hampering commercialization efforts. The above malaise was aptly captured by Melese (2006, p.2)[31] when she claims that “many opportunities are lost due to the lack of a defined process……”.

Therefore, attempts must be made to ensure that a proper framework exist to ascertain the smooth interaction and communication between these two entities. In this way, universities are able to live up to the expectation of playing their third role of local economic growth.

References:

[1] Friedman, T.L. (2007), The World is Flat: A Brief History of the Twenty First Century, Farrar, Straus and Giroux: MacMillan Inc.
[2] Etzkowitz, H. (2003), “Research groups as ‘quasi-firms’: the invention of the entrepreneurial university”. Research Policy, 32, 109–121.
[3] Rothaermel, F. T., Agung, S. D., and Jiang, L. (2007), “University entrepreneurship: A taxonomy of the literature”, Industrial and Corporate Change, 16(4), 691–791.
[4] Swamidass, P.M. and Vulas, V. (2008), “Why university inventions rarely produce income? Bottlenecks in university technology transfer”, Journal of Technology Transfer, 34(4), 343-363
[5] Harman, G and Harman, K. (2004), “Governments and Universities as the Main Drivers of Enhanced Australian University Research Commercialisation Capability”, Journal of Higher Education Policy and Management, 26(2), 153-169.
[6] Lehrer, M., Nell, P. and Gärber, L. (2009), “A national systems view of university entrepreneurialism: Inferences from comparison of the German and US experience”, Research Policy, 38(2), 268-280.
[7] Berman, E.P. (2008), “Why Did Universities Start Patenting?: Institution-Building and the Road to the Bayh-Dole Act” Social Studies of Science, 38(6), 835–871.
[8] Muscio, A. (2009), “What drives the university use of technology transfer offices? Evidence from Italy”, Journal of Technology Transfer, 35(2), 181-202
[9] Lettl, C., Rost, K. and Von Wartburg, I. (2009), Why are some independent inventors ‘heroes’ and others ‘hobbyists’? The moderating role of technological diversity and specialization”, Research Policy, 38, 243-254.
[10] Standish-Kuon, T.A. (2007), “Gray Matters: Understanding Academic Researchers’ Decisions About Commercializing Their Ideas and Discoveries”, unpublished thesis, Rensselaer Polytechnic Institute Troy, New York
[11] Wang, Y. and Sun, S. (2008), “Examining the Role of Beliefs and Attitudes in Online Advertising: A Comparison between the U.S. and Romania, Internations Marketing Review, 40, 67–72.
[12] Mehta, A. (2000), “Advertising attitudes and advertising effectiveness”, Journal of Advertising Research, 40, 67–72.
[13] Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000), “Competing models of entrepreneurial intentions”, Journal of Business Venturing, 15, 411-432.
[14] Moroz, P.W., Hindle, K.G. and Anderson, R.B. (2008), “Commercialisation of new knowledge within universities: exploring performance disparities, International Journal of Technology Intelligence and Planning, 4(1): 4-19.
[15] Von Hippel, E. (2007), “Horizontal innovation networks–by and for users”, Industrial and Corporate Change, 16(2), 1-23.
[16] Jain, S., George, G. and Maltarich, M. (2009), “Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity”, Research Policy, 38, 922-935
[17] Markman, G.D., Siegel, D.S. and Wright, M. (2008), “Research and Technology Commercialization”, Journal of Management Studies, 45(8), 1401-1423.

[18] Wright, M., Clarysse, B., Lockett, A., and Knockaert, M. (2008), “Mid-range universities’ linkages with industry: Knowledge types and the role of intermediaries”, Research Policy, 37(8), 1205-1223.

[19] Lindelöf, P., Löfsten, H., (2004), “Proximity as a resource base for competitive advantage – university–industry links for technology transfer”, Journal of Technology Transfer, 29, 311-326.

[20] Fiet, J. (2007). ‘A prescriptive analysis of search and discovery. Journal of Management Studies, 44, 592–611.

[21] Patton, M. Q. (1990), "Qualitative Evaluation Methods", 2nd Edition, Beverly Hills, CA: Sage.

[22] Yin, R. K. (1994), “Case Study Research, Design and Methods”, 2nd ed. Newbury Park, Sage Publications.

[23] Siegel, D. S., Veugelers, R., and Wright, M. (2007), “Technology transfer offices and commercialization of university intellectual property: Performance and policy implications”, Oxford Review of Economic Policy, 23(4), 640-660.

[24] Eisenhardt, K. M. and Graebner, M. E. (2007), “Theory building from cases: Opportunities and challenges”, Academy of Management Journal, 50(1): 25-32.

[25] Arora, R. and Stoner, C. (2009), “A mixed method approach to understanding brand personality”, Journal of Product & Brand Management, 18(4), 272-283

[26] Ajzen, I. (2002), “Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behaviour”, Journal of Applied Social Psychology, 32(4), 665-683.

[27] Holtzhausen, L. and Fourie, L. (2009), “Employees’ perceptions of company values and objectives and employer-employee Relationships: A theoretical model”, Corporate Communications: An International Journal, 14(3), 333-344.

[28] Linton, K., Stone, P. and Wise, J. (2008), “Patenting trends & innovation in industrial biotechnology”, Industrial Biotechnology, 4 (4), 367-390.

[29] Worasinchai, L., Ribie`re, V.M. and Bechina Arntzen, A.A. (2008), “Working knowledge, the university-industry linkage in Thailand: concepts and issues”, The Journal of Information and Knowledge Management Systems, 38(4): 507-524.

[30] Wang, Y. and Lu, L. (2007), “Knowledge transfer through effective university-industry interactions: empirical evidences from China”, Journal of Technology Management in China, 25(2), 119-33.

[31] Melese, T. (2006), “Building and managing corporate alliances in an academic medical center”, Research Management Review, 15, 1-9.

[32] Tseng ML, Wu WW, Lee CF. (2011). Knowledge Management Strategies in Linguistic Preferences. Journal of Asia Pacific Business Innovation and Technology Management , 1(1) , 60-73

[33] Tseng, M.L. (2010). An assessment of cause and effect decision making model for firm environmental knowledge management capacities in uncertainty. Environmental Monitoring and Assessment161, 549-564