ENHANCING ACADEMIC RESEARCHERS’ PERCEPTIONS TOWARD UNIVERSITY COMMERCIALIZATION

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Abstract
Commercialization of university’s research has drawn growing attention of late as it is increasingly seen as drivers to local economic growth. However, current studies have focused mainly on factors affecting commercialization assuming their presence would encourage greater commercialize activities. While this assumption is satisfactory, anecdotal evidences indicated that the presence of those factors sometimes do not improve commercialization. We argued that this anomaly is due to the influence of university researchers’ perceptions toward commercialization which manipulate their propensity to engage in this activity. This paper begins by reviewing the various mechanisms to commercialization in Malaysia universities. The impact of perception on commercializing activities formed the second part of the analysis. Recommendations to enhance commercialization within a university environment are also highlighted.

Keywords: Commercialization; Mechanism; Perception; Factors.

INTRODUCTION
It is no coincidence that universities of late are increasingly viewed upon as local economic contributors (Etzkowitz, 2003); especially when the 21st century economy placed so much emphasis on knowledge as one of the factors of production (Friedman, 2009). Being traditionally a source that pushes the frontier of knowledge through research and development (R&D); universities are expected to translate their superior research and development results into useful and marketable products (Sheft, 2008; Wonglimpiyarat, 2009). Universities responded to this challenge by creating various entities such as industrial science park and incubation centers (Colyvas et. al., 2002; Rothaermel et. al, 2007), spin-offs centers (Swamidass and Vulasa, 2008) and technology transfer offices (Harman and Harman, 2004; Rothaermel et. al, 2007) to fulfilled its dual role of achieving academic excellence and R&D commercialization.

However, the rate of universities’ commercialization success has fall short from the initial expectation and excitement by the stakeholders (Lehrer et al., 2009). While it is irrefutable that the number of patent applications has been growing in a rather exponential rate especially after the introduction of Bayh-Dole Act in the US(Berman, 2008); the number of successful venture creations remains rather mundane. Attempts to understand the link between entrepreneurial cognition constructs and its consequences however remain relatively underexplored (Lim et al., 2010). Entrepreneurial cognition which attempt to explain individual’s decision making process (Mitchell et al., 2002) occurs when the perception of desirability and feasibility cognitions interacts (Krueger and Brazeal, 1994). Additionally, there are deficiencies in our understanding of the dynamics behind the cognitive process that influence academic researchers towards commercializing their innovations. This probably explained the lackluster returns of those ‘support systems’ such as incubators and technology transfer offices. The apparent underdeveloped area was raised by Audretsch et al. (2006, p.63) when they claimed that “future research needs to further probe why and how scientists choose to commercialize their research”. This obvious grey area needs further exploration if supplementary understanding is to be made on the impact of perceived feasibility and choices that researchers have made to commercialize their research findings.

According to Santos and García (2006), the attention given to understanding the influence of cognitive processes in decision making is nothing new. Various
theories have been forwarded to explain, predict and modify individual’s decision making and behavior; with the theory of planned behavior or TPB (Ajzen, 1991) being the most enduring (Sniehotta, 2009). Accordingly, behavior has a linear relationship with intention and perceived behavior control (PBC) where greater intention and PBC towards a particular volitional behavior are more likely to elicit the intended behavior. Thus, TPB conceptualized changes in cognition towards a particular targeted behavior as antecedents to behavioral change (Ajzen, 1991; Sutton, 2002).

The commercialization process involves four phases of commercialization – conception, gestation, infancy and adolescence (Aldrich and Martinez, 2001). This paper focuses on the impact of perception at the conception stage. Thus, we will confine our discussion on the relationship between the perceptions of researchers toward commercialization and their propensity to engage in this activity. Hence, this paper allows us to expand the landscape of understanding the mechanism for technology transfer from academia to the market through the merging of the psychology and economic domains of commercialization. The failure of past entrepreneurial research that highlights the role of perceived feasibility to engage in commercialization and acting entrepreneurially has created a vacuum in the university entrepreneurship’s literature (Standish-Kuon, 2007). We hope to plug this deficiency through the examination of academic researchers’ perception and commercialization.

LITERATURE REVIEW

Mechanisms of Commercialization

Currently, the actual contributions of universities towards technology transfer growth has been rather under-represented (Bercovitz and Feldmann, 2006; Audretsch et al., 2006). Justifications to the apparent lack of reports on commercialization outputs from universities include: a) data collected from the technology transfer office (TTO) is incomplete wherein commercialization occurs at various units within a university system rather than confined to the TTO only; and b) transfer made from fundamental research has not been accounted (Mazzoleni and Nelson, 2005). In the study by Mazzoleni and Nelson (2005) on industry respondents, it was reported that general findings, techniques and instruments are considerably more important to business entities than prototypes. Hence, channels such as publication, meetings, seminars and conferences are important conduits for potential commercial ventures beside TTOs.

The above discussion indicated that the assessment of technology transfer effectiveness must include both formal and informal transactional mechanisms. Bercovitz and Feldmann (2006) offer an interesting topology that incorporated these mechanisms (refers to Table 1).

<table>
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<th>Table 1: Mechanism of commercialization</th>
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<tr>
<td>Mechanism</td>
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<tr>
<td>Sponsored research</td>
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<td>Licenses</td>
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<td>Hiring of students</td>
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<td>Spin-off firms</td>
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<td>Serendipity</td>
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An interesting outcome of the above model is serendipity. This informal mechanism has not been really studied in previous researches related to university’s commercialization (Nilsson et. al., 2009). This could be attributed to the difficulties of conducting qualitative research, which is very time consuming and costly. Audrestch et al. (2006) highlighted this particular factor of underestimation in university commercialization by analyzing contribution of university researchers instead of the TTOs.

The discussion above indicated that the popular use of the quantity of patents as metric to measure academic research commercialization has been rather under-representative. Academic research is translated into societal application via a much more diverse and multi-facetted mechanism. Hence, further exploration on the conduits that academic researchers choose to commercialize their innovations has to include this diversity.

Perception and Behavior
There has been no dearth of studies relating to perceptions and behavior. To date, two views about their relationship dominated discussions (Wang and Sun, 2008). The first view deems the two constructs as equitable and compatible; hence, they are used interchangeably and without distinction (Mehta, 2000). Humphreys et al. (2010) proposed the theory of statistical learning to explain the aforementioned observation. Accordingly, when concepts are spatially close together they will create a link which resulted in “co-occurrences” of action within the same temporal event. In the case of perceptions and behaviors, they are regularly seen “in close proximity and they can both be in motion at the same time” resulting in a single ‘action unit’ (Humphreys et al., 2010, p. 202).

The second view, which has been gaining a lot of attention of late, maintains that perceptions are antecedent to behavior (Brackett and Carr, 2001). Studies by Wang and Sun (2008) on individuals’ perceptions and their behavior towards online advertisement substantiated this notion with the impact of perception on behavior more pronounced when higher order of cognitive processing is called upon. Similarly, Robbins and Judge (2008) when studying the relationship of perception and risky behavior; discovered that individual’s perceptions precede their thought and behavior. Likewise, study on risky behavior such as smoking addiction (Chen, 2009) and car accidents (Ivers, 2009) reported higher displayed of risky behavior is statistically associated with lower perception of risk. Perhaps, some of the most prominent theory-driven models adopted by many researchers in the area of entrepreneurship that recrudesce from this perspective has been the Ajzen’s TPB (1991) and Shapero’s Entrepreneurial Event or SEE (1982). These two models stand out because of their simplicity and applicability with the main constructs rested on the notion of perceived desirability (social perception of others towards the proposed behavior) and perceived feasibility (perception of being in control on one’s own behavior). Of the two concepts, studies have shown that the perceived feasibility construct has greater influence towards volitional behavior (Kruger et al., 2000). Through the examination of individual’s behavior and perceptions as proposed by the said models, we are able to predict the inclination of that person towards commercialization (Gaddam, 2008). Recent studies however, have indicated that there are several variables such as attraction of an idea, the individual environment during their formative years, need for achievement, locus of control, independence and external influence that could sway an individual’s decision. Nevertheless, there is no doubt that perceptions dominated people’s thoughts and alter their behavior (Robbins and
Judge, 2008). Because individual decision is a key component for entrepreneurial studies, the focus on perceptions is therefore critical (Smith-Hunter, 2009; Keh, Foo and Lim, 2002).

Reports on the relationship between human perception and knowledge organization indicate that the former plays the cognitive subsystems of performing information and data processing function which lead to concept building (Barat, 2007). In other words, perception precedes knowledge organization which later influences human actions.

**Perceived Feasibility**

The concept of perceived feasibility was first proposed by Shapero in his model of SEE to explain entrepreneur’s decision in initiating a new venture (Shapero, 1982). In his postulation, a founder of new venture initiation must first perceive that the venture is a believable opportunity or “credible” (Krueger, 1993). When the perception of both feasibility and desirability reached a threshold level coupled with the precipitating of a displacing event, then individual will act upon such opportunity. In the study of entrepreneurship, perceived desirability argued Shapero (1982) is directed to the perceived reaction of people who are important to a particular individual towards the proposed behavior i.e., entrepreneurial engagement is a social desirability construct. We argued that this construct has little impact on commercializing behavior of academic researchers in this study because of two main reasons: (a) the environment in which academic researchers work is analogous resulting in almost similar social desirability experience (Palmber, 2008) and (b) commercialization is not a celebrated endeavor in the academic world and they do not improved one’s position or prestige amongst their peers (Baldini et al., 2007; Lehrer, Nell and Gärber, 2009; Swamidass and Vulasa, 2008).

Perceived feasibility refers to the extent that one believes is capable of starting a business. For commercialization to happen a person or a team must perceive that the course of action can actually be realized (Shepherd and Krueger, 2002). In other words, perceived feasibility reflects the extent to which a person or a team perceives their chances of success. Hence, the perception of feasibility is closely associated with individual’s beliefs about efficacy i.e. people believe of their capacity to successfully perform a particular task. The relationship between perceived feasibility and self-efficacy was first suggested by Bandura (1990) and later confirmed by other researchers such as Eden and Aviram (1993), Waung (1995) and Shepherd and Krueger (2002). People with high self-efficacy tend to display high level of effort and persistence resulting in improved performance as compared to those with lower level of self-efficacy (Eden, 1992). Thus, self-efficacy influences not only our choice of action but also the sum of our effort. Research on team efforts also found that a team’s belief about their collective abilities and effectiveness to execute a series of actions to yield a certain level of acceptable performances had the same influence as individual self-efficacy (Shepherd and Krueger, 2002). It should be noted that the concept of collective efficacy is not the aggregation of each team member’s self-efficacy (Shepherd and Krueger, 2002). There are sufficient examples to demonstrate that individuals with relatively low self-efficacy are able to produce high team efficacy due to group interactions and collective manipulation and exchange of information through regular group cognitive discourses. The above discussions indicated the importance of perceived feasibility to volitional behavior. People with higher degree of perceived feasibility are more likely to act in the manner that support his/her perception due to the belief...
that successful performance of that behavior is more probable than possible. Perception of feasibility could also derive from interactions with the right group.

Taking a cue from the earlier studies on the effects of belief towards attitudinal exploitation such as Standish-Kuon (2007) and Kruger et al. (2000) where individual researcher’s perception of feasibility in engaging commercialization and his/her tangible conduct are closely linked, we thus propose that there is a strong relationship between perception of feasibility towards commercialization and the performance of the said behavior.

In the intentional model proposed by Ajzen (1991) and Shapero (1982), intention precedes behavior. In other words, perceived feasibility is thought to influence individual intention to engage in a particular behavior which later translated into the said behavior. Following the above proposition, we sought to negate the entrepreneurial intention of those models by interviewing academic researchers who have already commercialized or in the midst of commercializing their innovations. We argued that the intention construct does not quite fit here because intentional models insist that there should be a “displacing event” (Krueger, 1993, p. 7) i.e. subjects are at the cross road of their career decisions – to start a business or continued employment. This is contrary to the position of academic researchers in Malaysia universities where they are allow to continued employment on top of being an entrepreneur.

**RESEARCH DESIGN**

Based on the gap in the current literature related to effects of perception specifically perceived feasibility on commercialization and the manner in which academic researchers choose to commercialize, further study needs to examine this scenario. We employed the case study method in line with Patton’s (1990) suggestion that this is the desired method for exploring human behavior and attitudes. Moreover, the use of case study would also ensure that in depth perspectives which could provide convergent evidence on an issue are considered (Yin, 1994). Recently, Seigel et al. (2007) suggested the use of case studies in the study of commercialization because it involves inter disciplinary and in depth analysis of the topic studied.

We started our analysis by using multiple case studies since this method is able to produce a more robust result (Eisenhardt and Graebner 2007); to generate an early topology of the mechanisms used by academic researchers to commercialize, with Bercovitz and Feldmann’s (2006) model at the background. Five cases of early phases of commercialization or pre-commercialization were studied. The case studies focus on key researchers since they are seen as the main player in making the all important decision on commercialization. Our focus in this particular study is to understand two main constructs in commercialization: researchers’ mode of transfer from laboratory to market place and the influence of perception on commercialization. Interviews were conducted at the interviewee’s convenience and each occasions lasted between 90 to 120 minutes. Each interview session was also recorded and transcript after each session to ensure minimum loss of information. Data collected was coded and analyzed based on the theme of the study i.e., the respondents’ recollection of the means and process that they have gone through to commercialize their research findings. Information obtained was categorized based on earlier literature exploration with additional grouping added when the no existing categories were available. Data related to the respondents’ perception during the process to engage in the commercial applications of their
innovation was also recorded and classified in accordance to the empirical data’s dynamism. The case studies were implemented at three research universities in Malaysia that have the presence of the Malaysian Technological Development Corporation (MTDC) offices at their campus. This provides a rather similar environment for commercialization even though they may differ in terms of their organizational background such as the size of the universities, the detailed structure of their human capital and comprehensiveness of the universities. One important feature of this study is that the presence of technology transfer offices in tandem with MTDC does not mean that researchers are bonded to these structures. In Malaysian universities, researchers are free to participate in whatever means of commercialization that they perceived as the most appropriate. This verifies Mowery’s (2005) emphasis wherein the transfer of technology should not be confined to a single channel dominated by the use of TTOs as in the US model but rather multiple channels or entities established between the university and industry. We believe the presence of the multiple channels adopted by Malaysian researchers to commercialize their innovation will be able to provide a more integrated perspective to the process of research commercialization by academic researchers.

RESULTS
Our analysis indicated that the mechanism for commercialization as proposed by Bercovitz and Feldmann (2006) is applicable here albeit some addition. The coded transfer mechanisms for the new additions include formal knowledge aggregation such as publication and conference presentation; personal effort; informal discussion and; temporary attachment wherein academic researchers work as consultant or engage in some related organization during their sabbatical leave. The detail topology suggested by our study is given in Table 2. The following description below offers brief depictions on the mechanism of transfer that happened (Table 2).

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<th>Mechanism</th>
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<td>Personal endeavor</td>
<td>Researchers through their own efforts seek to attract investors by sending their R&amp;D result to private firms, government agencies and other stakeholders outside the university.</td>
</tr>
<tr>
<td>Public presentation</td>
<td>Researchers publish their findings via journal publication and conference and wait for interested parties to approach them.</td>
</tr>
<tr>
<td>Sponsored research</td>
<td>University receives funding for research; testing materials or prototype via collaborative effort with third party sponsor whereby the IP belongs to the financier.</td>
</tr>
<tr>
<td>Licenses</td>
<td>Legally able to use a particular piece of university’s IP.</td>
</tr>
<tr>
<td>Patents</td>
<td>Researchers file for protection of their findings and innovations with the relevant patent office.</td>
</tr>
<tr>
<td>Spin-offs</td>
<td>The formation of a new entity from a university’s research or license.</td>
</tr>
<tr>
<td>Employed personnel</td>
<td>Students or knowledge personnel hired as research officers or assistants under a university’s sponsored projects.</td>
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<td>--------------------</td>
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</tr>
<tr>
<td>Consultancy</td>
<td>University’s employed researchers that provide their expertise and/or are pursuing research projects with industry.</td>
</tr>
<tr>
<td>Informal discussion</td>
<td>Researchers discuss ideas and/or innovations with community of experts or industry captains.</td>
</tr>
<tr>
<td>TTO</td>
<td>Researchers are part of the working groups that are charged to commercialize his/her research output.</td>
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Perception of academic researchers and its behavioral modification indicated the close proximity between these two constructs. This is consistent with the expectation of the Theory of Planned Behavior which suggests that perception has better explanatory capability of the variance in behavior compared to the traits model (Ajzen, 2002). The significant relationship between perception and actual behavioral feat was also reported by other scholars in different contexts (e.g. Wang and Sun, 2008; Dubois et al., 2000; Holtzhausen and Fourie, 2009). Hence, we conclude that perception has a significant impact on the decision making of an academic researcher to commercialize. Putting it differently, academic researchers who perceive the engagement of commercialization activities as feasible are more likely to commercialize their innovations. The brief description of each case study below reflects the mechanism of transfer along with the perceived feasibility of researchers’ engage in commercialization.

**Case A: Synergistic Blend**

This researcher was invited by another colleague about the possibility of synergizing their area of expertise in order to explore the commercial potential of his research in the area of petroleum additive. They have very different backgrounds which they believe would complement each other weaknesses effectively. One has the technical expertise while the other possessed business acumen with extensive industrial network. The researchers publish their findings in various conferences and were able to attract the interest of various government agencies, exemplifying the transfer mechanism of “publications and conference presentations”. Subsequently, they receive funding from the MTDC to commercialize their innovation and later patent their work. Individually, each viewed commercialization as untenable since they did not have the necessary skills and means to succeed. We argued that the key researcher understand the commercial value of his research but recognized the limitation of his business knowledge and network from successfully launched his innovation into the marketplace. Once paired with the right person, the key researcher became more confident and is willing to go the extra mile of having his research commercialized. In other words, his perception of a successful venture was enhanced sufficiently for him to take action with the introduction of his partner.

**Case B: Personal Network**

The key researcher together with her post graduate student had discovered packaging material that is biodegradable. A biodegradable food packaging with an in-built indicator to specify the freshness of organic compounds underneath it via enzymatic reaction was later developed. This innovation was results of numerous interactions with her community of experts as well as input from industry’s players derived from her extensive network. She was approached by several interested parties through her informal channels to commercial her innovation which
exemplify the “hire personnel” and “informal discussion” mechanism of transfer of technology. Her innovation was later shortlisted by the TTO at her university as having satisfactory commercial potential. MTDC was later convinced to provide her with the initial funding for commercialization, illustrated the mechanism of sponsored research. Of late, she was in discussion with MTDC to create a spin-off company for the right to commercialize her innovation. On top of this innovation, this researcher had also developed a few other innovations and managed to attract industry players into shared commercialization via two modes i.e. licensing and joint research. She has decided to work with the industry player instead of her university TTO because she believes the industry players are more aggressive and responsive in pushing for commercialization. This influences her greatly and it becomes a welcome stress that not only strengthen her belief in her ability but induced her to markets her innovations. She enjoys the challenge that comes with commercializing her innovations and is positive of her ability to learn and improve with each effort. However, she finds that university lacks in recognizing and awarding commercialization effort of its researchers resulting in the deficiency of the “can-do factor”. Moreover, the sheer volume of work and bureaucracy has turned away many budding innovators from commercializing their innovations.

Case C: Support Deficiency
This key researcher focuses on marine transportation system and marine engineering. He has successfully pioneer the GRP Assault Boat (Fiberglass) for the Military but did not commercialize it as he left to further his post graduate studies. Upon graduation he designed, modified and fabricated a new kind of aqua transport using the principle of hovercraft as reference point. This innovation was presented to various parties and attracted a lot of attention from the public agencies particularly from the military office. This exemplified the “publication and presentation” mechanism of technology transfer. However, his innovation was not commercialized because of two reasons: i) the technical skills to migrate from prototypes to commercially produce goods were not available; ii) the absence of linkages with the industry to ascertain their needs even though the ideas was a breakthrough in the marine industry. Moreover, the lack of fund for equipments maintenance also hampered the progress of the prototype to commercialization. Due to the poor evaluation from the TTO office made most by the lack of technical expertise to fully comprehend the breakthrough ideas of the innovation, the support for commercialization has been found inadequate. Though, third parties especially from the military has indicated their interest in his prototype, the lack of support; business presentation skills and time have made it unattainable to commercialize his innovations. This experience only serves to question his ability, the university interest and devotion to successfully commercialize his marine transportation innovation. He has decided to abandon commercialization in exchange for academic activities that university value such as publication, research, supervision and education.

Case D: Industrial Setup
The key researcher had previously patented three biotechnology products in Egypt and has extensive networks both locally and internationally. Currently he is looking into the extract of a new strain of Probiotics (viable non-pathogenic microorganisms that colonize the intestine which modify the intestinal microflora and their metabolic activities that positively affect the health of the host) from human breast milk. His finding was published and presented in various conferences and has attracted the attention of a few pharmaceuticals companies. Following
this, the key researcher interacted extensively in the beginning with the researchers from the industry to fine tune the research into a viable market product indicating the “informal discussion” mechanism of transfer of technology. Eventually, one of those companies chooses to work closer with the key researcher with the hope of commercializing the research thereby exhibiting the “publication and conference presentation” mode of transfer of technology. The above exploration of the transfer of technology from laboratory to market is made possible due to the geographical advantage of the university where it is strategically located at the industry hub, creating network of opportunities. The strategic location thus enable scientist to intensify their interaction and collaborative actions with the relevant industry partners in order produce innovation with market value, which ties nicely into the findings of Harman and Harman (2004). The key researcher summarized this by stating: “Universities and industries must engage each other to produce something of value to the market. We should not be sitting in our silos and mind our own business.” Since the beginning of their study, the orientation has always being to commercialize the findings. This stand was taken by the key researcher because of his past experience in commercialization and his believe that scientist should tailored their study with the eventual outputs that satisfy the market needs. He recapitulates this by stating “research must be able to brings benefits to the people and it’s easy to commercialize when people wants it”. In fact he propagates the idea that scientists should change their mindset from patenting to industrialized focus. However, commercialization effort has been slow due in part to the bureaucratic inefficiencies and others the atypical vocabulary of industry players and academic researchers.

**DISCUSSION**

The transfer of university research by faculty members to the market place is increasingly seen as the next driver of economic development. This means that universities around the world are now required not only to excel in academic pursuit and education but also to spur on local economic expansion. Hence, faculty must be persuaded to shed the ‘anti-commons effect’ at worse or to go beyond patenting at best. In other words, faculty must overcome the initial inertia toward exhibiting commercializing behavior. In this study, we responded to the call of Audretsch et al (2006) to further understand the decision taken by academic researchers in commercializing their inventions. Their plea makes the case of our study interesting, partly because such an investigation has been absent in Malaysia and partly due to the particular attempt to understand the precursor cognitive process of the decision to commercialize.

The first part of this study focuses on the mechanism that academic researchers exploit to commercialize their inventions. We found that academic researchers are quite innovative in this respect; employing various kinds of strategies. Indeed our study indicated that academic researchers are quite resourceful utilizing publications and conferences to attract would be industry partners with the aim of securing additional resources and ideas for research and commercialization. This platform is not alien to academic researchers as it has been used traditionally to seek additional research funding (Elfenbein, 2007; Palmberg, 2008). The use of consultancy and informal discussion as means to commercialization are two interesting revelation from this study. These platforms provide academic researchers avenues to test and refine their innovations and/or ideas in line with markets need (Perkmann and Walsh, 2008). Indeed studies by Swamidass and Vulasa (2008);
Eldridge (2007) and Palmberg (2008) on the use of consultancy and community of experts as idea bank to generate new ideas and innovations supported the above argument. TTOs traditionally has been the more popular mode for commercialization since it serves as the gateway to university inventions, establish linkages between the university (Rothaermel et al. 2007) and industry and validating university–industry relationships (Muscio, 2009). However, the caveat for the use of TTOs includes strong administrative, technical and communication skills (Sloman, 2007); high marketing competencies (Siegel et al., 2004) and; poor network base of relatively new academic researcher (Muscio, 2009).

The proposal that perceived feasibility to engage commercialization precedes the actual exhibitions of such behavior provided the first insight into overcoming the inertia towards commercialization. Hence, academics must be convinced that it is feasible to partake in commercializing activities, which is not unlike the findings of Wang and Sun (2008) or Holtzhausen and Fourie (2009). This observation agrees with Barat’s (2007) postulation on perceptions and behavior in that perceptions pervade actual actions. We find that this proposition correlates with our findings wherein faculty members with greater inclination towards commercialization tended to perceive commercialization as a viable venture. It also complements the Lettl et al. (20009) study which showed that inventors’ perceptions have as much impact as technology in turning ‘hobbyists’ into ‘heroes’.

However, the relationship between perceived feasibility and the displayed of commercialize behavior is not merely confined to the temporal basis. In knowledge organization, perceptions give rise to a particular picture in the mind which resulted in people adjusting their action based on that representation (Barat, 2007). Hence, when academic researchers perceived commercialization as feasible, they will adjust their action appropriately. Evidences gathered from the case studies show that the perception of feasibility has resulted in an inordinate amount of the capacity to produced and transformed knowledge.

“Once you believe it (commercialization) can be done, it is something that you must do. It’s a nagging feeling and not doing it is no longer an option”.

Case C

Previous authors have suggested that the presence of confidence, commitment and stress act as inoculation to self efficacy (Li, 2006) which influences perception of feasibility (Krueger et. al, 2000). We couldn’t agreed more but argued that perceptions of feasibility and those aforementioned variables interact and influence each other continuously either to strengthen or weaken one another. A putative model (Figure 1) is presented below to illustrate the emerging patterns of perception of feasibility and its influence on commercialized behavior.

Figure 1: Model of emerging patterns in perception of feasibility

![Diagram of the Model of emerging patterns in perception of feasibility](image-url)
What the model shows is that if the authors’ formulation is correct, then the micro impact of perceived feasibility i.e. the researchers’ perspective on the viability of commercialization is a dynamic state of affair. Indeed, the case studies emphasis this point when the respondents summarizes:

“When you perceived commercialization as viable, you become more confident and committed to succeed which make you better believe the possibility of commercialized your findings. Not to commercialize then is like letting yourself down”.
*Case B*

“It’s like a cycle where confidence breeds believe and believe drives confidence which eventually enable you to act on it”.
*Case D*

Perceived feasibility which is antecedent to commercialized behavior is thus influence by the sense of competence which is the interaction of confidence, commitment and stress variables within an individual. This finding is parallel with the theory of self efficacy proposed by Bandura (1990). Hence, we cannot deny the effects of self efficacy and group efficacy on the perceived feasibility construct (Bandura, 1990; Waung, 1995; Shepherd and Krueger, 2002). Self efficacy or group efficacy are constructs referring to the perceptions of situational competence (Krueger et al., 2000). Case A suggests that the group efficacy prompted both researchers to work in a synergetic way hence improved the chances of success. Case B and Case D on the other hand, indicated that the key researchers have inherently a high degree of self efficacy and belief in his/her own ability to learn and improved on their innovations. This kind of tenacity is one of the traits of a successful entrepreneur (Bagozzi et al., 1992). Thus, we agreed that the presence of this trait amplify the effect of the perception of feasibility to engage in commercialize activities.

Another aspect that we suspect contributed to the high perception of feasibility in key researchers in Case B and Case D and the low level of perceived feasibility demonstrated by Case C have been the past experience of the respondents. Studies have shown that past experiences have important influence of entrepreneurial behavior (Shapero and Sokol, 1982; Harris et al., 2008). Both key researchers in Case B and Case D have successful commercialized venture before as opposed to Case C. These past experiences success increase their self-esteem and confidence which resulted in a more positive attitude toward risk and independence (Harris et al., 2008).

Moreover, the respondents have already a stable job and lead a comfortable life and are also quite outstanding in their respective fields. So the entrepreneurial behavior is more of a choice than a necessity. Thus, it does not warrant them to take the necessary risk as an entrepreneur unless the environment is really urging you towards commercialization as in the Case C.

Other features which influence the perception of feasibility towards commercialization has been the presence of business to complement technical skills of academic researchers; the importance of collaborative network; and the dynamism of university environment towards commercialization.

Various scholars have highlighted the lack of business skill to commercialize as one of the impediments to academic entrepreneurship (for example Jain et al., 2009; Muscio, 2009; Moroz et al., 2008; Lerner, 2005; Lockett et al., 2003). The findings of this study (Case A) confirmed
this observation. This is hardly surprising given that most academic researchers have over the years sharpened their expertise and experience in the technical field resulting in a deficiency of business skill. Often ‘white coat’ scientists make poor entrepreneurs (Moroz et al., 2009). Moreover, academic researchers often consider their research as knowledge advancement rather than commercial attainment (Palmberg, 2008); resulting in little need to honed their business knowledge. In view of this, it is important for universities to pool together their resources especially through the inclusion of business major faculty members in commercialization. In this way, entrepreneurial activities would be viewed from a more positive perspective.

Collaborative effort and networking with the industry are mainly through the effort of individual researcher rather than through university. Past authors have indicated that the mediocre collaborative effort with industry could be attributed to the deficiency in a proper framework between universities and industries due to the embryonic nature of university commercialization (Wu, 2009; Worasinchai et. al., 2008; Wang and Lu, 2007). However, we find this argument feeble as there exists MTDC offices on the respondents’ campuses wherein these offices are tasked to enhance linkages between universities and industries. Perhaps the lack of awareness amongst academic researchers could be the contributing factor, as all of the MTDC offices are located away from the universities’ main faculties. The prejudiced view where academic researchers are perceived as being “difficult to work with” (Palmber, 2008) and the general distrust of faculty members toward the industry (Jensen et al., 2003; Wu, 2009) also compounded the problem. In this regard, the university authorities and MTDC officers need to increase the visibility, understanding and functionality of MTDC’s roles. More effort must also be made to bridge the industry and university differences toward understanding their respective roles and the utilization of each player’s area of specialization in building the value chain of commercialization.

Universities are well known for being very bureaucratic. Scholars have suggested that to encourage commercialization, faculty members must be convinced that the organization is able to respond and adapt effectively to the demand of teaching and research as well as the third mission of economic development. This is only possible if universities adopt a structure which allows academic researchers to deal with the dual roles of teaching and research; and commercialization (Siegel et al., 2003b; Chang et. al, 2009). The positive impact of entrepreneurial policy onto technological commercialization has been well documented (Zhang et al., 2008). Case D highlighted this importance facet in order to improved perception of feasibility of faculty members towards commercialization.

CONCLUSION
This study is based on a limited number of respondents from three universities in Malaysia. As such, the result has restricted external validity especially with the abundance of academic researchers located at other universities, both public and private. Nevertheless, we believe that the conclusions and model developed here are still relevant and may even be pertinent beyond the national context. Prior studies have shown that perceived feasibility posted the highest influence on entrepreneurial intention (Harris et. al., 2008; Krueger et. al, 2000). Therefore, policy makers may want to enhance this construct if more laboratory innovations are to be translated into viable products. More importantly, since entrepreneurship is not a genetic trait but a “learned skill” (Zimmer and Scarborough, 1998, p. 7) the
results of this study meant that we can modify academic researchers’ orientation towards commercialization if appropriate perceptions are put in place. In this way universities are able to fulfill their expectations of initiating local economic growth, i.e. its third role.

REFERENCES


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