Volume: 1 Issue: 2 [December, 2016] pp.22-36]
International Journal of Accounting, Finance and Business
eISSN: 0128-1844
Journal homepage: www.ijafb.com

# FINANCIAL SUPPORT FOR INNOVATION: IMPLEMENTATION OF A TECHNOLOGY DRIVEN POLICY INITIATIVE IN EMERGING ECONOMIES

Dzulkifli Mukhtar[1]

[1] Faculty of Entrepreneurship and Business, University Malaysia Kelantan,
Email: dzulkifli@umk.edu.my

Accepted date: 17 August 2016, Published date: 19 September 2016

---

**Abstract:** *Emerging economies have introduced a portfolio of policies to propel economic development. Policies are acknowledged as powerful tools to promote industrialisation and economic diversification. The features of these policies are not only confined to established emerging economies but also mid-ranking emerging economies like Malaysia. As the country moves towards a knowledge-based economy, this study provides insight into how a policy comprising a financial initiative introduced by Malaysian Government has been used to enhance capabilities of indigenous small and medium enterprises particularly for innovation. This study is exploratory since it seeks to find out how firms developed and enhanced their innovation capabilities in the presence of government policy. It identifies the implementation of the financial initiative in particular is in line with the specific objectives of the policy which is intended to support commercialisation of research outputs among indigenous small firms. This study also found that this policy initiative tends to affect the latter end of the innovation process (i.e. in particular in the exploitation phase) rather to the innovation process in general. This study contributes to closing some of the gaps in research into public support for innovation and development of knowledge-based economy within emerging economies. In particular it identifies the target group and impact of such policy initiative, particularly in the context of policies designed to upgrade firm's capacity to carry out new product development process for high-technology products.*

**Key words**: Emerging economies, innovation, dynamic capabilities, case study.

---

## Introduction

The rapid economic growth achieved by emerging economies generated a huge amount of research interest into the mechanism behind the economic take-off. The main contrast in the literature has been the role of the government vs markets in catching-up development (Chang, 1999). Scholars also provide technology-based view that focuses on explaining how emerging economies have tried to catch up technologically with developed economies (Hobday, 2005). Industries in advanced economies are at the frontier of technological advancement. In this view, catching-up is considered as a question of relative speed in a race involving a fixed multi-directional process (K. Lee & Lim, 2001). Scholars also highlight that emerging economies do not simply follow the technological development of advanced countries. They may create their own individual path which is different from the developed economies.

While many appreciate the rapid economic growth achieved by emerging economies(World Bank, 1993), there has recently been concern that some countries have been more able than others to catch up technologically. Scholars suggest that the success factor of these emerging economies is based on their ability to build and develop their national innovative capacity. National innovative capacity refers to a country's prospective to produce a stream of commercially relevant innovations (Porter & Stern, 2001). This capacity is not only confined to production of new products or services, but also echoes the fundamental conditions, investments and policy choices which create an environment for innovation.

In building up national innovative capacity, governments in emerging economies have implemented a portfolio of strategies (Hsu & Chiang, 2001). These strategies have produced different impacts and outcomes within which strategies that include policy initiatives are also subject to divergence. However, the implementation of technology-driven policy initiatives in emerging economies is often associated with failure to achieve their objectives in terms of uplifting national innovative capacity. However, little is known about what factors contribute to that failure (Özcelik & Taymaz, 2008). This is an important insight which could be brought to studies on implementation of policy initiatives, especially in regard to their screening and monitoring process.

## Literature review

### Emerging economies and high-technology industrialisation

Research on economic development pays particular attention to regions or countries that were able to position themselves as contributors to global wealth. It has been acknowledged that Western economies[1] are the frontiers of the world economy (Szirmai, 2012). However, recent evidence suggests that the global economy started to consider progress beyond the Western economies (Szirmai, 2012). Countries from different continents have emerged as new blocks of economies that have managed to achieve remarkable progress in economic development. Hoskisson et al. (2000) suggest that these economies could be known as emerging economies. One explanation for the remarkable economic growth within the emerging economies is their ability to make changes in the economic structure (Nelson & Pack, 1999). This was also the same successful recipe for developed economies' transition in the eighteenth and nineteenth

[1] Szirmai (2012) describes the Western economies as countries in Europe and North America that have been promoted manufacturing sectors as the main engine of accelerating economic growth since nineteen century such as Great Britain, Germany, Russia and the United States.

centuries. However, the changes in economic structure took place at a faster place within emerging economies out of necessity in order to catch-up with more advanced economies of the West (Dowling, 1997). Amsden (2001) argues one of the major reasons for emerging economies to embark on manufacturing-led industrialisation is because the states' intention to catch-up with advanced economies by emulating their industrial composition through establishing manufacturing activities that produce high-technology products such as electric and electronic goods. Szirmai (2012) supports Amsden's proposition by affirming arguments on why manufacturing is essential for economic development. Pisano and Shih (2012) refine this argument based on the experience of the American manufacturing sectors. They propose that the high-technology sector is essential in innovation process because it entails the importance of generating and utilisation of technology in the industry. This strengthens Szirmai's argument that a high-technology industry is important for technology catching up especially among emerging economies.

According to Atkinson and Ezell (2012), emerging economies face a great challenge to promote high-technology industrialisation. The aims of this type of industrialisation is different from ordinary industrialisation that tries to introduce and promote manufacturing activities into emerging economies (Ali, 1992). High technology industrialisation is a transition process from assembly-type manufacturing to high technology manufacturing (Ali, 1992). Nelson and Romer (1996) describes this process as a transition from simple, labour-intensive and low value-added industrial activities to those embodying more intensive use of human capital and technology. In the context of emerging economies, policies for high-technology industrialisation are targeting local firms to venture into high-technology sectors. Above all, high-technology industrialisation does not only require governments' commitment to encourage local firms to utilise technology but also to support them to develop new technology into finished products or processes (Blanes & Busom, 2004). For Smith (2015), the process of developing new technologies and utilising them into products can be regarded as an innovation process. Figure 1 illustrates the innovation process.

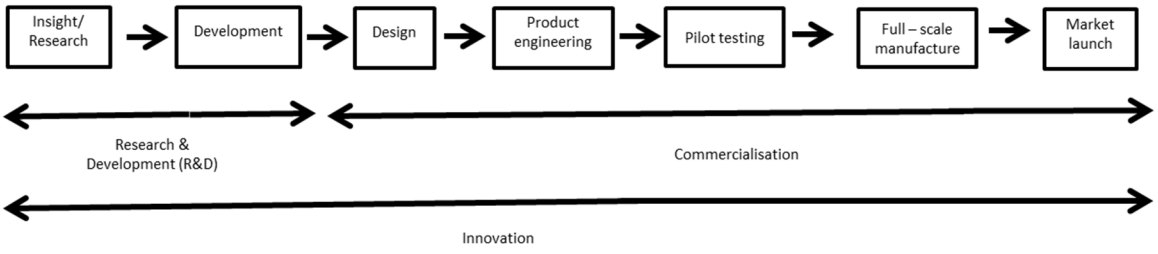


**Figure 1: A generic model of innovation process**
Source: Adapted from Smith (Smith, 2015)

Scholars agree that innovation is a complex process (Rasmussen, 2008). In this process, Lee and Gaertner (1994) suggest there are two components involved: 1) technology development and 2) technology dissemination. The former component focuses on discovery of new material, technique or solution. Meanwhile, technology dissemination involves a process of bringing the output from the technology development into usage that is embedded in finished products (Y. Lee & Gaertner, 1994). The two processes need to co-exist in order to maximise the technology utilities.

**Firm's competiveness in high-technology sectors**

This study investigates the influence of a technology driven policy initiative on a firm's competitiveness in the high-technology sectors in an effort to understand the policy's application. By empirically studying interaction between policy and firm behaviour, it is possible to identify areas for improving policy design and implementation. Particular attention is paid to evidencing the existence of effective business activities within firms in high-technology sectors that can plausibly be linked to the presence of government support. This study also considers a theory in strategic management literature that explain how firms can develop business programmes and sustain competitiveness: the Dynamic Capabilities (D. J. Teece, Pisano, & Shuen, 1997).

The Dynamic Capabilities (DC) framework stems from the Resource Based View (RBV) (Eisenhardt & Martin, 2000). The DC draw heavily on how a firm absorbs and applies knowledge. In doing so, it emphasises routines (Eisenhardt & Martin, 2000) and the importance of the individual on organisational routines (D. J. Teece, 2007). The DC was first defined as the 'ability' firms use to 'integrate, build and reconfigure' other assets, capabilities and competences to address a changing environment (D. J. Teece et al., 1997) and create market change (Eisenhardt & Martin, 2000). The idea that firms possessed the ability to modify their resource base meant that they could now keep up with industry dynamics. The term 'dynamic' refers to changes in capabilities to achieve congruence with the changing business environment. Certain innovative responses are required when time-to-market and timing are critical, the rate of technological change is rapid, and the nature of future competition and markets is difficult to determine. Within the DC concept, 'capabilities' refers to, routines, norms, values or learning ability that come into existence when individuals or firms possess tacit knowledge. The capabilities component of the definition therefore emphasises the capacity of firms to appropriately adapt, integrate and reconfigure internal and external firm skills, resources and functional capabilities. Therefore, DCs are the ability or capacity of a firm to change their static capabilities to match the requirements of both internal and external changing environments.

The DC suggests that the concept of firms needs to be understood from a wider perspective. Prior to the DC concept, firms were often understood as organisations that try to gain competitiveness by acquiring unique and strategic resources. This understanding was built on the assumption that firms will maintain a certain structure and that the market remains stagnant (D. J. Teece, 2007). However, the DC concept suggests that firms need to make changes in order to address a dynamic market (D. Teece & Pisano, 1994). The change can be incurred in resources configuration, organisation structure and competencies in a process to identify and shape opportunities (D. J. Teece, 2007).

A major argument underlines by DC theory concerns the importance of recognising firms' ability to execute activities as evidence that they have been utilising resources. This view is applicable to government initiatives to develop new industries because most external interventions, such as government support programs exist as resources for the firms. It becomes more prevalent when the support program is meant for a specific purpose and has been implemented in a common mechanism such as financial assistance. The interaction between the supplied resources through that programme demands that firms execute an array of activities. For some scholars, most activities carried out by firms can be categorised as DC. However, Easterby-Smith et al. (2009) argue against this idea by suggesting that only specific activities to accommodate opportunities can be considered relevant to the DC framework. Teece (2010) addresses the discussion of the sort of activities that should appear in the DC theory by suggesting that firms' activities can be divided into three elements: 1) identification and assessment of opportunities (sensing); 2)

mobilisation of resources to address an opportunity and capture value from doing so (seizing); and 3) continued renewal (transforming). Each of the clusters has been embodied by a portfolio of sub-processes that essentially try to create and capture value from opportunities.

The elements include manufacturing activities that are crucial for production of tangible products. The manufacturing activities allow firms to address their external environment such as products regulation through safety testing and customer demand by getting the customers' feedback. The main principle is to highlight the importance of transforming static organisational capabilities or creating new ones to meet changes in the environment. In fact, both areas of DC and industrial economics try to study ways firms can be more competitive by promoting innovation in the economy. Apart from this, the DC framework tries to study innovation in a context of strategic management by connecting innovation with competitive advantage. In strategic management, innovation is considered as a multifaceted capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting and reconfiguring firms' resources (D. J. Teece, 2007). It may involve probing and re-probing customer needs and technological possibilities. Each activity demands that firms have the ability to understand latent demand, industry structure and market. Indeed, innovation itself is a dynamic process because being able to bring invention to the markets requires a different configuration in each activities, in research, manufacturing and marketing activities. In other words, each activity need to be progressive which requires a combination of resources and capabilities to respond to changes in external environments.

This study adapts the DC and at the same time modifies the RBV. The main rationale because in emerging economies context, Government perceive in order to improve firms' innovation performance, they need to invest more in R&D activities. The Malaysian Government has been dependent on industrial policies to promote innovation but often policy makers do not have a clear idea how these policies work within firms. Therefore, investment in R&D is very blunt instrument and probably not effective. In fact, this investigation needs some sort of concept or construct to explain this phenomenon. The RBV provides internal perspective of innovating firms where they try to consider internal and external factors of innovating firms. In that case, DC is a much better way of looking at how to improve innovation. The main argument of DC is firms can spend a lot money (especially in emerging economies) but if they do not have capabilities to actually use what R&D is producing, there will be no innovation. Therefore, DC is relevant in this particular context because it promotes the understanding of firms' capabilities to execute tasks within innovation process. Besides that, DC also is a concept that just not only focus on one capability but a number of capabilities. Some of these capabilities are in R&D and some are related to other activities such as manufacturing and marketing. This means that it is just not R&D capabilities needed to improve innovation but there are other capabilities (i.e. production and selling capabilities) that play a crucial part. These capabilities interact and work together. In short, DC has the underpinnings of a strong theory. First it can show causality as several studies show how dynamic capabilities can cause a firm to have more innovative capacity (Verona & Ravasi, 2003). Second, it is measureable because it can be measured through learning outcomes and technological innovation performances such as new products, sales performance, market share and employment. Indeed, some of the understanding on how capabilities have changed could be obtained from econometric analysis. It means that most of the understanding could be gained once researchers get inside firms. This perspective leads to case study approach.

## Methodology

The focus of this research is an in-depth study of a biotechnology firm. The firm is known as Bio 1, is one of the recipients of financial assistance from Malaysian Government. Using a single but in-depth case study provides a scope for investigation, which Yin (Yin, 2009) notes is one of the benefits of using case studies as a research design. Case studies are especially appropriate in research in which the objective is to examine social phenomena that are complex (Yin, 2009). Innovation and the process of developing firms innovativeness are interrelated fields that are individually complex. Innovation process is often evolved and case studies are seen as a way to capture it. Case study approach also offer opportunities to look inside the firms and at their practices in particular. It is hard to pick this up from using surveys (questionnaires). Case study design also enables the researcher to look at the bigger picture. Besides that, case study also favours for the researcher to have a bit of contact with firms over a period of time which facilities multiple data collection techniques (i.e. interviews, archival data and observation). These techniques will give and in-depth and detailed picture of firms' practices and what they do for innovation. From here, the researcher could interpret why the firm operates in these ways.

This study employs triangulation technique which involves the application of several methods to collect data from different sources. Saunders et al. (2009) suggest the use of two or more independent sources of data or data-collection methods within one study is useful to ensure that the data could produce a more complete portrait of the situation. The primary data source is interview transcriptions and it is triangulated by the use of documentary and observation narrative. This technique provides a better representation and consistent insight of what actually happened in the firms as the data sources corroborated with each other. It also enables the strengths and weaknesses of the various methods to be counterbalanced and a more holistic picture of organisational environment to be developed.

## Case study

Bio 1 was originally incorporated as a start-up firm in 1996 by a scientist, Miss Ht. The firm has been operating in a promoted industry: biotechnology. The Malaysian Government has identified biotechnology as one of the core technologies to accelerate the transformation of Malaysia into a knowledge-based economy and an industrialised nation by 2020. The firm sought to become a product development company that is capable of manufacturing products for sustainable plantation (mainly oil palm and paddy plantations) and other agriculture activities. The firm's products have been developed based on applications of microbes as fertilisation and decomposition agent aimed at improving crop productivity, land rehabilitation and soil fertility. Bio 1 has been dependent on R&D capabilities in its products' development. In fact, its first product (a bio-fertiliser marketed as MYCOgold) was developed from research on *Mycrorrhizae*[2]. The fungus' applications remain the firm's core source of technology and have provided the central path for the firm's research and development (R&D) and all its strategic direction. To date, almost all of Bio 1's products have been dedicated to these applications.

The firm's route in innovation has been dependent on its amplification of scientific discovery and technological breakthrough. This recruitment practice has been continuing in the expansion stage. It has allowed the firm to have a pool of qualified personnel in interrelated disciplines. The firm's executive personnel comprise of universities graduates. They hold Bachelor of Science and qualified as biologist, microbiologists or agriculturists. Based on their education background,

[2] *Mycrorrhizae* refers to a group of fungus which forms a mutually beneficial relationship with plants. These fungi grow either inside of a plant's roots or attach to the surface of roots.

the executives are researchers by training. They are deemed to have understanding how a research based firm should work and the importance of technological breakthroughs.

The firm's capacity in innovation could be witnessed in terms of introduction of new products and financial attainments. Since 1999, Bio 1 has produced eight products. The firm's products focus on niche a market for sustainable plantation (mainly oil palm and paddy plantations) and other agriculture activities. The main reason for this move because the oil palm industry forms the economic backbone of Malaysia. Malaysia a main producer of palm oil for the global market.

Financially, Bio 1 has experienced significant growth in term of turnover and profitability from 2005 to 2010. In that period, the firm was able to achieve average turnover growth of 44.41 per cent. The highest sales growth was incurred in between 2008 and 2009 with 115.72 per cent growth, meanwhile the lowest sales growth was in 2006 with 0.58 per cent. Bio 1 has experienced more substantial growth in profitability with an average of 93.75 per cent in the same period. The most substantial growth was in 2007 with 377.01 percent hike. Table 1 summarises Bio 1's turnover and profitability.

**Table 1: Bio 1's financial performance**

| Year Ended | Revenue (MYR) | Direct Cost (MYR) | Profit (MYR) | Fixed Asset (MYR) | Current Asset (MYR) |
|---|---|---|---|---|---|
| 2005 (USD1= MYR3.80) | 3.09 | 1.07 | 0.33 | 7.43 | 1.27 |
| 2006 (USD1= MY3.70) | 3.11 | 1.20 | 0.41 | 7.87 | 1.81 |
| 2007 (USD1= MYR3.47) | 4.55 | 0.91 | 1.96 | 8.53 | 3.16 |
| 2008 (USD1= MYR3.37) | 5.08 | 1.97 | 1.09 | 10.8 | 12.99 |
| 2009 (USD1= MYR3.56) | 10.92 | 5.65 | 2.02 | 16.51 | 15.81 |
| 2010 (USD1= MYR3.25) | 13.13 | 6.95 | 3.59 | 22.01 | 22.81 |

Source: Extracted from Bio 1's financial statements retrieved from Companies Commission of Malaysia
Note: Financial figures are in millions

## Context of the financial grant from Malaysian Government and the product

Bio 1 has been awarded with a financial grant by the Malaysian Government in 2007. Bio 1 applied for MYR5,000,000 and was approved for MYR3,200,000 because the grant is limited to providing 70 per cent of the total project cost. The grant was approved for commercialisation of a microbial based insecticide which is marketed as Metaxorb. The bio-insecticide was a new product' category besides bio-fertilizer and bio-remediation.The Metaxorb is a bio control insecticide which applies the *Metarhizium anisoplie* to control a rhinoceros beetle (Oryctes rhinoceros) problem in oil palm plantations. *Metarhizium anisoplie* is a soil-inhabiting fungus well known as a microbial agent against insects and a host-specific for the rhinoceros beetle. This product is essential in Bio 1's initiatives to establishing a niche market demands in the oil palm sector that is now ready to adopt more sustainable methods of agricultural productions driven by increasing environment awareness. The Metaxorb is packed in 1-litre bottle and this

product has been expected to fulfil big plantation companies' demand. The plan under the grant's project was to produce and market 5,000 litres of Metaxorb. This plan was viable because before receiving the grant, the production of Metaxorb had been carried out using small scale machines.

**The firm product development capabilities**

Metaxorb is an outcome of Bio 1's product innovation. The firm has been dependent on discovery of microbes that could be commercialised as fertilization and decomposition agents. The discoveries are the result of the firm's research and market penetration activities. Indeed, the processes are challenging and time-consuming. Although the development of Metaxorb started in 2004, the firm's capabilities in products development have been building up since 1998. At that time, the firm was starting to develop its first product by making improvement to technology acquired from a university. In that stage, the academic research was enhanced based on the executives' basic research that *Myhorrhiza* has been tested empirically on vegetable plants. There was no research guidance except the fundamental technology from a local university

The experience with their first product has convinced Bio 1 to amplify scientific discovery and technological breakthrough. This process is segregated into two sections: 1) discovery of new microbes and 2) finding quadrupling techniques for microbes' enrichment. However, developing a new bio-based agriculture products proved difficult. The firm has been dependent on processes related to identifying and integrating innovations. This process meant exploration phase of the innovation process. The executives initiated this process by scouring journals to look for scientific opportunities in term of new potential microbes. Their qualification proved applicable in this process. However, the empirical works within the academic literature are limited to certain plants only. This restricts the application of the scientific discoveries (i.e. potentially beneficial microbes). In Bio 1's case, the firm is interested in commercialisation of *Mycorrhiza*. However, the empirical works in universities does not firmly discuss which plants are suitable for *Mycorrhiza*. Bio 1 perceives this as more general application of the fungus. Therefore, the firm decided to expand their research work into field testing to determine the *Mychorrhiza'*s applicability.

In the initial stage, field testing was carried out based on the executives' basic research knowledge that *Myhorrhiza* has been tested on vegetable plants. There was no research guidance except the fundamental technology from a university The first field testing was carried out on oil palm and rubber seedlings. The seedlings are owned by Bio 1's prospective customers. The result from the field testing suggested that oil palm and rubber plants are compatible with *Myhorrhiza*.

The firm is also deemed to have significant experience and proper facilities for manufacturing. From its inception, the firm has carried out the manufacturing activities on its own. There were no outsourced activities. This arrangement has facilitated production of eight products within ten years of operation. On average, Bio 1 spent between two to four years before a product could be sold on the market. For example, the development of Metaxorb was started in 2004 and was officially launched in 2008. The development of Metaxorb was expected to have taken a longer period because it is a totally new products.

The firm's research capabilities are essential in the product formulation. The main outcome was the product sample (i.e. prototype). At that time the firm did not have any production facilities except to run the production activities at laboratory scale. Indeed, the production scale in one of the obstacles for Bio 1 in the product development. It became more apparent when the firm did

not have an allocated budget for designated production line. Still, the firm perceived the needs to upgrade the production capacity from laboratory scale to industrial scale.

The fund from the grant has been used to acquire new machines that lead to the firm's capacity upgrading. Before that, for example, the old autoclave for grooming the fungus (i.e. the *Metarhizium anisoplie*) could only cater for 50 samples. Certain processes were even performed manually. The firm has recognised this as its weakness because the production line generated limited output, hence limiting the firm's production capacity. The newly acquired autoclave can accommodate 200 samples. In this case, the grant has increased Bio 1's investment capacity and manufacturing capability. However, under the grant's arrangement, a recipient needs to have incurred expenses before the remaining 70 per cent will be disbursed on a claimed basis. However, Bio 1 did not have any allocated budget. As an option, Bio 1 decided to approach SME Bank[3] for a loan to cover 90 per cent initial outlay to acquire that machine. Bio 1 also made an initiative to renegotiate the terms of grant with the Government pays upfront 10 per cent outlay. Then after Bio 1 took the delivery of that machines, the firm made the reimbursement application and used that money to pay out the loan from SME Bank. This occurrence is illustrated by Figure 2.

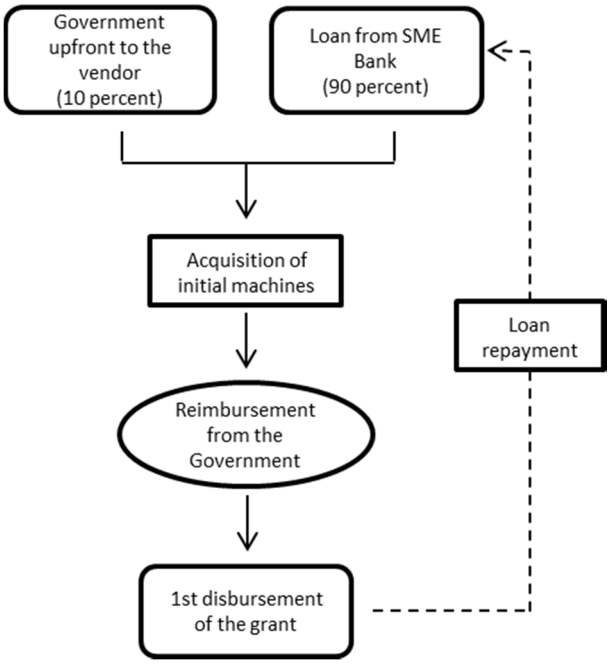


**Figure 2: Grant's application in Bio 1**

The grant had facilitated the initial outlay of Metaxorb's production capital expenditure. From this initial process, Bio 1 was able to acquire additional machines via reimbursements until the grant has been fully reimbursed in 2011. However, the partial grant term required Bio 1 needed to be creative in administering the grant and production. This induced a notion that the grant is working but not as positively as expected. Firstly, the work of grant through the evaluative session helped Bio 1 in the production planning. Secondly, the firm needed to list machines needed for production of Metaxorb.

The comment explains that the firm needed to prioritise because the grants disbursements were by each machine. Secondly, the machines reduce Bio 1 dependency on manual worker as the

[3] SME Bank is a full-fledged financial institution for nurturing SMEs excellence in Malaysia.

production technique became more automated. Each stage of production activities has taken less time. However, Bio 1 needed to face a bigger challenge in terms of manufacturing. The automated system required each machines to be working well. However, this has been not always the case. In order to avoid this, the machines need to meet a costly maintenance schedule. The maintenance is not only costly but also increases the production idle time thereby increasing the overhead cost.

By focusing on big plantation companies, Bio 1 needed to adopt different approaches especially in getting in touch with customer for sales purposes. Sales were initiated by directly approaching plantations and estates. However, this sales approach was less effective because any decision is subject to plantation managers' discretion. The managers converged in a special group known as planters. Based on these circumstances, Bio 1's personnel needed to join the planters group. During their monthly events, planters discuss their plantation problem and Bio 1 has benefited from this in terms of recognising unmet needs of their customer. Bio 1 also tries to maintain good relationships with planters by sponsoring souvenirs. However, the main challenge is about overcoming competition from chemical products. Bio 1's approach is about not directly rejecting chemical product, but instead introducing gradually substitution technique to customers. This sales technique requires Bio 1 to convince the customer to use their existing chemical up to certain threshold level and then start to use Bio 1's product. Most of the advice is derived from Bio 1 laboratory and field works.

In this regard, the big plantations' demands have a large bearing on the firm's strategic path in term of demand for its products' innovation. However, this perceived demand did not guarantee market acceptance. Bio 1 needed to dedicate substantial resources to gaining access and acceptance among plantation companies. Based on their operation scale, the big plantation companies might have demanded large quantities of bio-based products. It means that, Bio 1 could have received large orders from their customers. However, this move created challenges for Bio 1. The plantation companies required product quality control and requested reliable data on product application. The main reason was that Bio 1 did not have experience in plantation and its products were new to the market.

## Case analysis and discussion

### Policy implementation

There was a lot of speculation about whether policies could be used to enhance local firms' technological capacity (Kim & Nelson, 2000). This assertion is also applicable to the grant because it is a major policy initiative to facilitate innovation by ensuring research and discovery will reach the market. In Weiss's work (2013), he suggests that governments have to put significant efforts into the refinement of policies to make them more rigorous. This means policy documents need to explain clearly the objectives, aims and implementation mechanisms. This improvement is essential to minimising risk of a policy failure (Weiss, 2013). The case studies presented here establish that the grant has been well managed by the Government. The evidence shows that the firm was convinced that grant's funding is meant for upgrading their ability to proceed with a new product development (NPD) process although the firms anticipated other challenges in innovation projects.

Prior studies also highlight that undertaking innovation projects is challenging and thus often associated with firms' failure to complete that projects (Özcelik & Taymaz, 2008). For some researchers, failure to complete innovation projects is influenced by factors that are linked to products and markets (Gurdon & Samsom, 2010). These general findings were adopted by other

scholars as the basis of an argument for government support for innovation projects. In this sense, past evidence seems to suggest that within government policy initiatives in particular fiscal initiatives (i.e. where money goes to firms), there is a tendency for innovation projects to never be completed. This study shows more positive outcome for fiscal policy in terms of project completion. The firm was able to complete the innovation projects under the grant. This suggests that the grant has been implemented in an effective and prudent manner. Firstly, the grant is a partial grant; firms was only being approved for 70 per cent of the total the project cost although the maximum funding is MYR4 million (USD1=MYR3.30). Therefore, the firms needed to come up with the remaining 30 percent of the project cost in form of cash. This is the grant's major requirement. This finding implicitly concurs with a study by Hobday and Rush (2007) that looks into initiatives by another government (i.e. Government of Thailand) in emerging economies to uplift local firms' technological capabilities. Hobday and Rush's work shows that government policies show best results when directed towards firms that have a positive attitude and commitment towards self-funding aspect of a designated innovation project. Otherwise the risk of failure will be relatively high. Furthermore, a study by Cooper (2003) showed that the matching grant structure can be considered as fund improvement. This is because programmes to support innovation projects are typically seen too generous and carry a bad reputation of being non-selective. This might expose firms for not being accountable for their designated projects.

The above finding also corroborates the views of Hsu and Chiang (2001) whose study looks into government efforts in another emerging economy (i.e. Taiwan) to support R&D activities for the advancement of domestic industrial technology. An element shared by the context of both studies is that firms participating in sponsored innovation projects are expected to contribute required resources, such as manpower. Unlike the present study, Hsu and Chiang's study appears not to have explored the issue of financial commitment in terms of cash required from participating firms in sponsored innovation projects. Conversely, the findings of this study shows that the Malaysian Government establishes clear guidelines for 30 per cent financial commitment from the firms.

**Target firm**

Studies have established that innovation projects are best carried out by an appropriate group of firms (Rasmussen, 2008; Vohora, Wright, & Lockett, 2004). For Rasmussen (Rasmussen, 2008) who looks at the Canadian Government's support for universities to commercialise research outputs found that the most suitable candidate is spin-off firms. This is relevant for initiatives involving direct financial support like the grant due to the possibility of miss-targeting (Kaufmann & Todtling, 2002). In this sense, the findings of this study support an argument in previous studies that suggests innovation support programmes should target specific groups. Indeed, evidence from the case study established that the grant has targeted and reached a specific firm: small, indigenous and high-technology firms. The firm is also still in operation with some of them becoming fairly profitable.

The findings of this study also suggest that selecting the appropriate target group might be the decisive element (i.e. small high technology firms) in innovation projects. In reflecting upon the importance of small high technology firms, this finding lends some support to the study by Hobday and Rush (Hobday & Rush, 2007) that suggests only a small fraction of small firms innovate although in a general sense small firms are more receptive to change compared to large firms. This means that there is certainly a type of small and medium sized firms but does not necessarily mean all small firms are high-technology firms. At this point, one primary reason that small firms were seen as the main beneficiaries of this policy initiative because they appear to be underdeveloped in the context of emerging economies like Malaysia (Ali, 1992). Besides that,

small firms made up the majority of local firms in high technology sectors and this factor motivates Malaysian Government to support them. In addition, due to their flat organisational structure small high technology firms have the required flexibility to deal with technological changes while fulfilling customer needs.

The case study suggests that the grant has targeted the exploitation phase of the innovation process as it emphasises manufacturing activities because for the firm, manufacturing is the bottleneck in commercialisation of research. This is the direct impact of the grant and this study trying to show that the programme is doing what it supposed to do. In this sense, the programme seems to be efficient. However, this study also highlights that firms also encounter needs other than those addressed by the grant. This condition could be explained by the provision in which grant is not targeting at the most serious problems constraining firms that try to carry out innovation activities.

**Impact**

In government efforts to support innovation, the target group (i.e. local firms) are expected to experience improvement in their resources and also their ability to carry out a NPD process. More importantly this process entails the firm's ability to utilise resources and translate them into a set of capabilities. This study shows evidence that the firm's has experienced improvement in capabilities that are closely related to the innovation process. It means that the firm is better at doing innovation and these capabilities are being part of the organisation. Most of the improved capabilities are not in research development (i.e. exploration phase of innovation process) but in capabilities applicable to the exploitation phase of innovation process. This finding implicitly concurs with a study by McKelvie and Davidsson (2009) which has also established the same relationship. However, McKelvie and Davidsson propose a relationship based on discrete capabilities that could be considered independently. Instead, this study identifies the influence of resources to interrelated capabilities to bring high technology products into market. This means, capabilities in the exploitation phase are made up of reciprocal activities such as production, selling and NPD activities.

This is consistent with a study by Aldridge and Audretsch (2010) that looks at applicability of a R&D fund to innovation projects. However, their findings were rather focused on measuring innovation in terms of spending on research activities that eventually produce intellectual properties such as patents. Thus, the findings of this study complement Aldridge and Audretch's work by highlighting that the key innovation capabilities reside in manufacturing activities, as this seems to be critical for exploitation of the innovation potential. The main rationale for this occasion is that the firm is a high-technology SME. The firm is deemed to have significant research capacities because it is being being managed by technical personnel (i.e. scientist). Yet, the firm is lacking of production facilities, which influences their manufacturing capacities in terms of scale and scope. Now, the firm is able to manufacture products at industrial scale and differentiate them as well.

The impact of the grant funding on firms' innovation process reflects the desirable outcomes of the programme despite government support initiatives have been extensively scrutinised by researchers (Kaufmann & Todtling, 2002). The main argument of Kaufman and Todtling (2002) is on inability for that type of support to reach its target; in this case producing innovation. The findings of this study suggest that the grant has been targeting at innovation projects and it has been contributing to firms essentially producing innovation. Therefore, the firm is able to upgrade their innovation capabilities because it has used the grant funding to improve, enhance

and upgrade their innovation capabilities. It means that firms are more capable of commercialising research as the result of direct usage of the grant's funding. Innovation within the firms produced new high technology products. The impacts also explicate the context of the grant within firms' innovation process as the grant has been involved in the later part of innovation process. This possibility reflects the purpose of Malaysian Government policies to facilitate innovation amongst local firms.

**Conclusion**

This study highlights the application of technology driven growth strategies and thus contributes to knowledge about the effectiveness of this policy (i.e. technological upgrading type of policy). In most of strategic management literature, inward looking aspects such as firm strategies, firm activities, managerial competencies and possession of strategic assets have emerged as common competitiveness factors (D. J. Teece, 2010). This study suggests in the context of policies for technological upgrading, firms are recommended to develop capabilities that allow them to utilise resources in order to address changing environment (Easterby-Smith et al., 2009). The main argument of dynamic capabilities is firms in emerging economies can spend a lot of resources but if they do not have capabilities to utilise the R&D outputs, there will be limited innovation. This means, firms should have capabilities execute tasks within innovation process.

From the larger context of Malaysia's innovation policy, this study highlights the challenges of commercialisation of research in emerging economies. A particular innovation support programme like the grant gives priority to certain stages of commercialisation process, which in this case, is the exploitation phase of the innovation process (i.e. targeted for full scale manufacturing and product market launching). Those activities in the exploitation phase, particularly at the latter part of it, received a lot of emphasis since firms are inclined to buy equipment and machines. However, the firm also need to give considerable attention to marketing and other elements of NPD (Smith, 2015). In summary, the evidence from the case study, confirms that the Malaysian Government's grant programme is effective in enabling small and indigenous technology-based firms to modify and extend their resources. This has extended firms' ability to successfully undertake activities within the innovation process. The firms' ability to undertake innovation projects is more applicable in the exploitation phase of the innovation process rather than earlier phase of exploration (i.e. R&D related activities). This programme has enabled the firm to undertake commercialisation activities relevant to the market that it is trying to address more effectively compared to the absence of the grant. As a result, there is compelling evidence to suggest the grant scheme has contributed significantly to raising the innovation capacity of small indigenous and start-up technology based firms. In this process, it has met the aims of technology-driven growth strategies of an emerging economy like Malaysia.

**References**


Aldridge, T., & Audretsch, D. B. (2010). Does policy influence the commercialization route?. Evidence from National Institutes of Health funded scientists. *Research Policy, 39*(5), 583-588.

Ali, A. (1992). *Malaysia's industrialization. The quest for technology*. Singapore: Oxford University Press.

Amsden, A. H. (2001). *The rise of "The Rest". Challenges to the West from late-industrializing economies*. New York: Oxford University Press.

Atkinson, R. D., & Ezell, S. J. (2012). *Innovation economics: The race for global advantage*. New Haven: Yale University Press.

Blanes, J. V., & Busom, I. (2004). Who participates in R&D subsidy programs?. The case of Spanish manufacturing firms. *Research Policy, 33*(10), 1459-1476.

Chang, H.-J. (1999). The economic theory of the developmental state. In M. Woo-Cumings (Ed.), *The developmental state* (pp. 182-199). Ithaca and London: Cornell University Press.

Cooper, R. S. (2003). Purpose and performance of Small Business Innovation Research (SBIR) program. *Small Business Economics, 20*(2), 137-151.

Dowling, M. (1997). Industrialization in Asia: A tale of two regions. *Journal of Asian Economics, 8*(2), 295-313.

Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic capabilities: Current debates and future directions. *British Journal of Management, 20*(March), S1-S8.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What they are? *Strategic Management Journal, 21*(October-November Special Issue), 1105-1121.

Gurdon, M. A., & Samsom, K. J. (2010). A longitudinal study of success and failure among scientist-started ventures. *Technovation, 30*, 207-214.

Hobday, M. (2005). Firm level innovation models: Perspective on research in developed and developing countries. *Technology Analysis & Strategic Management, 17*(2), 121-146.

Hobday, M., & Rush, H. (2007). Upgrading the technological capabilities of foreign transnational subsidiaries in developing countries: The case of electronics in Thailand. *Research Policy, 36*(9), 1335-1356.

Hoskisson, R. E., Eden, L., Lau, C. M., & Wright, M. (2000). Strategy in emerging economies. *The Academy of Management Journal, 43*(3), 249-267.

Hsu, C.-W., & Chiang, H.-C. (2001). The Government strategy for upgrading of industrial technology in Taiwan. *Technovation, 21*(2), 123-132.

Kaufmann, A., & Todtling, F. (2002). How effective is innovation support for SMEs?. An analysis of the region of Upper Austria. *Technovation, 22*(3), 147-159.

Kim, L., & Nelson, R. R. (2000). Introduction. In L. Kim & R. R. Nelson (Eds.), *Technology, learning & inovation. Experiences of newly industrializing economies.* (pp. 1-12). Cambridge, United Kingdom: Cambridge University Press.

Lee, K., & Lim, C. (2001). Technological regimes, catching-up and leapfrogging: Findings from the Korean industries. *Research Policy, 30*(3), 459-483. doi: http://dx.doi.org/10.1016/S0048-7333(00)00088-3

Lee, Y., & Gaertner, R. (1994). Technology transfer from university to industry: A large-scale experiment with technology development and commercialization. *Policy Studies Journal, 22*(2), 384-399.

McKelvie, A., & Davidsson, P. (2009). From resource base to dynamic capabilities: An investigation of new firms. *British Journal of Management, 20*(S1), 63-80.

Nelson, R. R., & Pack, H. (1999). The Asian miracle and modern growth theory. *The Economic Journal, 109*(457), 416-436.

Nelson, R. R., & Romer, P. M. (1996). Science, economic growth and public policy. *Challenge, 39*(2), 9-21.
Özcelik, E., & Taymaz, E. (2008). R&D support programs in developing countries: The Turkish experience. *Research Policy, 37*(2), 258-275.
Pisano, G. P., & Shih, W. C. (2012). *Producing prosperity. Why America needs a manufacturing renaissance*. Boston, Massachusetts: Harvard Business Review Press.
Porter, M. E., & Stern, S. (2001). National innovative capacity. *The global competitiveness report, 2002*, 102-118.
Rasmussen, E. (2008). Government instrument to support the commercialization of university research: Lesson from Canada. *Technovation, 28*, 506-517.
Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (Fifth Edition ed.). Essex, England: Pearson Education Limited.
Smith, D. (2015). *Exploring innovation* (3rd Edition ed.). Maidenhead, Berkshire, United Kingdom: McGraw-Hill Education.
Szirmai, A. (2012). Industrialisation as engine of growth in developing countries, 1950-2005. *Structural Change and Economic Dynamics, 23*(4), 406-420.
Teece, D., & Pisano, G. (1994). The dynamic capabilities of firms: An introduction. *Industrial and Corporate Change, 3*(3), 537-556.
Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319-1350.
Teece, D. J. (2010). Technological innovation and the theory of the firm: The role of enterprise-level knowledge, complementaries, and (dynamic) capabilities. In B. H. Hall & N. Rosenberg (Eds.), *Handbook of the economics of innovation. Volume 1* (pp. 680-707). Oxford, United Kingdom: North-Holland.
Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509-533.
Verona, G., & Ravasi, D. (2003). Unbundling dynamic capabilities: An exploratory study of continuous product innovation. *Industrial and Corporate Change, 12*(3), 577-606.
Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spinout companies. *Research Policy, 33*(1), 147-175.
Weiss, J. (2013). Industrial policy in the twenty-first century: Challenges for the future. In A. Szirmai, W. Naude & L. Alcorta (Eds.), *Pathways to industrialization in the twenty-first century* (pp. 393-414). Oxford, United Kingdom: Oxford University Press.
World Bank. (1993). *The East Asian miracle. Economic growth and public policy*. New York: Oxford University Press.
Yin, R. K. (2009). *Case study research. Design and methods* (Fourth Edition ed.). California: SAGE Publication.