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Training and Innovation among Knowledge-Based Companies in Malaysia

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Using data from an online survey, this paper attempts to (1) examine the innovative efforts undertaken by knowledge-based companies in Malaysia and (2) to investigate whether or not training has any impact on those innovative efforts. It was found that innovation was evident among the vast majority of the knowledge-based companies, namely, in the "development of a major new product", an "upgrade of an existing product", "patents or copyrights for a product" and the "introduction of a new technology that improved production process". A simple crosstab analysis suggests that when a training policy is in place, it not only positively influences innovation but innovation seems to be more important to the growth of the companies. Additionally, the regression result shows that training has a significant and positive impact on the company's propensity to innovate.

1. Introduction

Firms train their workforce for various reasons. One, in particular, is to accommodate the operational running of the business. As most firms operate in a competitive environment where stiff rivalry exists among similar businesses and each firm is knowledgeable about the activities of their rivals; firms traditionally compete via 'price competition', that is, by matching and beating the prices of their competitors. To succeed in price competition, firms strive to become the lowest cost producer.[1] For that reason, training is often carried out to improve the skills of workers

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[1] This is the standard neoclassical view, which assumes that competition prevents any individual firm from raising the price of its output to more than what covers the costs of its inputs.

because according to the human capital theory (Becker, 1962) this will increase the productivity level of the workers and, in turn, bring competitiveness to the firm.

However, as global economies progress to one that is more knowledge-based, this form of competition becomes no longer effective. With technology constantly evolving and opportunities to invest in R&D are made more available; firms find themselves another option to be the least-cost producer, that is, via innovation. By bringing new ideas into product design as well as production process, firms can not only reduce their costs but can ultimately improve the quality of their products or services they render. Training plays an important role here as well. As opposed to the previous situation where training is merely carried out to improve skills and productivity of workers, training now offers a boost to the workers' confidence and encourages them to become more innovative.

In Malaysia, empirical studies on training and innovation are very limited. The lack of such studies on knowledge-based companies is even more profound given that information on training for individual companies is neither available nor accessible to the public. To fill this lacuna in literature, the present study conducts an online survey on knowledge-based companies in MSC Malaysia to examine (1) the innovative efforts undertaken by these companies and (2) whether or not training has any impact on those innovative efforts.

The organization of this paper is as follows. Section 2 provides an overview of, mainly empirical, literature related to the link between training and innovation. Section 3 gives the rationale for focusing on MSC Malaysia, followed by a description of the data in Section 4. Sections 5 and 6 describe the model and variables used in the study. The empirical results are discussed in Section 7 and Section 8 concludes the paper.

2. Brief Review of Literature

Decades before his time, Joseph Schumpeter (1947) envisioned that when technology and know-how control the conduct of businesses, price competition "is not the kind of competition which counts, but the competition for the new commodity, the new technology, the new

source of supply, the new type of organization (the largest-scale unit of control for instance) i.e. competition that commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms, but at their foundations and at their very lives" (p.84). True enough, nowadays technology is continuously evolving and with various opportunities available to invest in R&D, firms find themselves the need to incorporate innovation into their operational strategy in order to remain competitive.

Innovation basically refers to something that adds value to a firm (Bhaskaran, 2006). It differs from invention because unlike the latter, innovation transforms an invention into a commercially useable technique or product (Laplagne and Bensted, 1999). Schumpeter is one of the first economists to define and draw attention to the importance of innovation. He distinguishes between "radical" and "incremental" innovations in which the former brings big changes in the world whereas the latter fills in the process of change continuously. Schumpeter also identified fives types of innovation (see OECD, 1997: p.16), namely, (1) introduction of a new good; (2) the introduction of a new method of production; (3) the opening of a new market; (4) the conquest of a new source of supply of raw materials and (4) the carrying out of a new organization.

The first two types of innovation above form the basis of the Oslo Manual's (OECD, 1997) classification of innovation as they are relatively easier to understand and measure. These classifications are "technological product innovation", which involves either a new or improved product whose characteristics differ significantly from previous products, and "technological process innovation", which is the adoption of new or significantly improved production methods, including methods of product delivery (p.32).[2] Given the broad scope of innovative activities, the measurement of innovation is likely to be difficult. Rogers (1998) distinguished the measures of innovation according to its inputs and outputs. Among the common input measures of innovation are R&D expenditures, intellectual property statistics and patents and licenses; whereas output measures of innovation are commonly in the form of firm performance, introduction of new or

[2] 'Products' refers to both goods and services

improved products or processes and percentage of sales from new or improved products or processes.

One branch of literature has found it worthwhile to investigate why firms innovate in the first place. According to Schumpeter, the main reason is that firms seek rents. With innovation, firms are able to bring new technologies into the economy so when an innovative process occurs, the firm gets a cost advantage over its competitors. This allows the innovator (or the firm) to gain a higher mark-up at the prevailing market price, or depending on the elasticity of demand, to use a combination of lower price and higher mark-up than its competitors to gain market share and seek further rents. In the case of product innovation, the firm gets a monopoly position due to either a patent or to the delay before competitors can imitate its product. This monopoly position allows the firm to set a higher price than would be possible in a competitive market, thereby gaining a rent.

Firms may also innovate to defend their competitive positioning as well as to seek competitive advantage. As shown in a model by Aghion *et al.* (2006), technologically advanced entry creates a competitive environment that forces incumbent firms to be innovative. In this situation, each potential entrant comes with leading-edge technology. If the incumbent is less technologically advanced, the entrant will replace the incumbent. Likewise, if the incumbent is also employing a leading edge technology, it can use its reputation advantage and block entry.

Given the importance of innovation to firms, it is clear why employers would want to impart innovativeness as part of their work culture. An effective way to do so is by training the workers. Previously when firms engage in price competition and focus only on being the least-cost producer, training was undertaken to improve workers' performance by coaching them to reduce wastes, work more efficiently and produce goods more abundantly. But all those feats were carried out by using existing technology. When firms realize that technology need *not* be stagnant, training may be used to coach the workers on how to (1) find cheaper ways to make existing products, (2) make new products using existing technology, or (3) make new products using new technology. Thus, training not only generates innovation, but together with investments in R&D, it develops the firm's "absorptive capacity", a concept developed by Cohen and Levinthal (1989, 1990), which refers

to the firm's ability to identify, assimilate and exploit knowledge from the environment. These are among the qualities needed for firms to remain competitive in the new age, a view that is supported by Ballot, Fakhfakh and Taymaz (2001) who found that training and its interaction with R&D are significant inputs in firms' productivity growth.

In short, there is an intricate link between innovation and training in today's economies (Booth and Snower, 1996). Firms that do not engage in training will fail to develop their workers' skills. As a result, these firms will risk the inability to take advantage of innovations or fail to promote innovation in the first place by not investing enough in their workers who are able to carry out R&D. In both instances, the lack of skills and training acts as a constraint for the firms to progress with their innovations (Mohnen and Röller, 2001). As workers participate in training and improve their skills, they will be able to undertake more complex tasks or to complete tasks better or faster. They may also have more confidence to share new ideas regarding the firm's products with their superiors. In some cases, innovation and training reinforce one another with the training of workers enhancing the profitability of innovative and more sophisticated technology.

3. Background of MSC Malaysia

MSC Malaysia is a national initiative spearheaded by the Malaysian government to develop and nurture the nation's ICT industry as well as to provide a test-bed for the global ICT industry (MDeC, 2008).[3] Conceptualized in 1996, MSC Malaysia was designed to help transform the nation into a knowledge-based economy driven by a knowledge society.[4] To facilitate future development and promotion of MSC Malaysia, the Multimedia Development Corporation (MDeC) was established to shape specific laws and policies for MSC Malaysia as well as to work closely with companies that want to set up their operations there (MDeC, 2007).

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[3] The concept of MSC Malaysia is similar to the Free Trade Zones (FTZ) concept developed in the late 1960s, which was to assist MNCs in exporting their products. The only difference is that MSC Malaysia is concentrated on knowledge-based and ICT-related products.

[4] This is the nation's Vision 2020 i.e. a long-term national agenda that was introduced by former Prime Minister, Tun Dr Mahathir Mohamed in 1991, which aspires for Malaysia to become a fully developed nation by the year 2020.

This study focuses on knowledge-based companies that attain the MSC Malaysia Status, henceforth, MSC-status companies.[5] There are several reasons for this. Firstly, these are local and foreign firms that rely heavily on multimedia and high-end technology to produce or enhance their products and for process development (MDeC, 2007), all of which are crucial in the process of innovation. Secondly, to qualify for the status, companies must meet several eligibility criteria, among which is to employ a substantial number of 'knowledge workers'. In the Malaysian context, knowledge workers are individuals who hold either a degree in any field from an institute of higher learning, OR a diploma in multimedia/ICT or specialized ICT certification plus at least two years' of relevant experience in multimedia/ICT or in a field that is a heavy user of ICT, OR a professional, executive, management and technical, work categories in IT-enabled services (MDeC, 2007). Knowledge workers are essential to the development of innovations as they are the manpower that drives the firms' operational strategies.

Thirdly, companies with MSC-status enjoy numerous benefits in the form of world class services and infrastructure, advanced communications infostructure, cyberlaws as well as financial and non-financial incentives. These privileges are backed by the Bill of Guarantees (see Table 1), which is part of the Malaysian Government's commitment to provide an environment that is conducive to the development of MSC Malaysia.

Given the nature of these companies along with the initiatives provided by MSC Malaysia, it is only expected that the MSC-status companies be innovative. Hence, this study also aims to affirm this situation as no other studies, to the best of the author's knowledge, have attempted to do so in the past.

[5] This status is awarded to private limited companies, incubators and institutes of higher learning (IHLs), each with different application criteria and guidelines. For the purpose of this study, only companies are of interest.

Table 1. Bill of Guarantees for MSC-status companies

- Provide a world-class physical and information structure
- Allow unrestricted employment of local and foreign knowledge workers
- Ensure freedom of ownership by exempting companies with MSC Malaysia status from local ownership requirements
- Give the freedom to source capital globally for MSC Malaysia infrastructure and the right to borrow funds globally
- Provide competitive financial incentives, including no income tax for up to 10 years or an investment tax allowance, and no duties on import of multimedia equipment.
- Become a regional leader in intellectual property protection and cyberlaws.
- Ensure no Internet censorship.
- Provide globally competitive telecommunications
- Tender key MSC Malaysia infrastructure contracts to leading companies willing to use the MSC Malaysia as their regional hub.
- Provide an effective one-stop agency - the Multimedia Development (MDeC)

Source: Multimedia Development Corporation (MDeC), 2008

4. Data

Data used in this study are drawn from an online survey of MSC-status companies.[6] The decision to use an online mode was based primarily on the characteristics of the sample. Since the MSC-status companies are accustomed to regular ICT usage, an online survey is considered appropriate and makes it more convenient for the Managers to respond despite their hectic and irregular work schedules.[7] Moreover, given the need to acquire as many responses as possible to yield a fairly

[6] The survey was conducted as part of the researcher's PhD programme with some funds acquired from the University of Nottingham and IIUM. Surveys on both the companies and KWs were conducted online and face-to-face, but for the purpose of this paper, only the company survey was utilised.

[7] According to Schaefer and Dillman (1998), a faster response rate is obtained with e-mail. In their study, respondents took on average of 9.16 days to return the questionnaires by e-mail versus an average of 14.39 days by postal mail.

acceptable estimate, an online survey was deemed more practical especially when there are time and financial constraints involved.

The working population consists of 1560 companies and are identified from the directory at the MSC Malaysia website.[8] Of this, 308 MSC-status companies were targeted for the survey and selection was made using a stratified random sampling to ensure representation from both local and foreign ownerships as well as the six sub-sectors or technological clusters in MSC Malaysia. The sample size was calculated based on a formula for small population size in Rea and Parker (1997), of which a 95 per cent confidence level and an acceptable margin of error of 5 per cent were used.[9]

Prior to contacting the companies, support letters from the University and the Ministry of Science, Technology and Innovation (MOSTI) were obtained as proof of research authenticity, should they be required. The Human Resource or Training Managers of the targeted MSC-status companies were then informed of the researcher's intentions and those who agreed to peruse the questionnaire were emailed a 'survey pack', which includes a cover letter stating the purpose of the survey, support letters, a document version of the Survey Questionnaire for MSC-status Companies (SQ1) and a link to the Web-based version of the survey.

Companies that declined participation were replaced by other companies from the same strata. Eventually, as increasing number of MSC-status companies that were *not* in the original sample list were contacted; the sample survey became a census. But due to non-response, the use of the census still does not guarantee that information was collected about all members of the population (Rodeghier, 1996), thus, the data constitute only a sample of the population and generalizations still had to be made back to the full population.

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[8] During the fieldwork period (late-2008), 1878 MSC-status companies were officially registered but not all of these companies were contactable, as they may have discontinued business due to poor performance. As advised by MDeC, only 'active MSC-status companies' were included in the sampling frame. Also, the survey excludes Institutes of Higher Learning, Incubators and companies located outside of the Klang Valley due to time and financial constraints.

[9] The response rate for online surveys that use telephone calls to contact potential respondents is as low as 36.3 per cent (Dillman *et al*., 1998). Thus, in prudence, 848 companies were contacted for this study. This technique of 'over sampling' is commonly used in an attempt to attain the required sample size for a particular confidence level (Sheehan and Hoy, 1999).

A total of 100 MSC-status companies responded to the survey, giving a response rate of 32.5 per cent (100 respondents out of 308 recommended sample size). This is consistent with most past studies and is acceptable for the purpose of analysis. Table 2 reports the breakdown of the respondents.

Table 2. The breakdown of the MSC-status companies by ownership and sub-sector

Sub-sector[1]	Local companies	Foreign companies[2]	Total companies
Creative multimedia	12	5	17
Software development	38	12	50
Support services	5	1	6
Hardware design	4	3	7
Internet-based business	9	1	10
Shared services & outsourcing (SSO)	3	7	10
Total	**71**	**29**	**100**

Note: [1]Since 2010, these sub-sectors have been renamed to Creative Multimedia, IHLs & Incubators, InfoTech and Shared Services Outsourcing; [2]There are three entities of MSC-status companies but for the purpose of analysis, joint ventures and foreign-owned companies are pooled together as 'foreign companies'.
Source: Survey Questionnaire for the MSC-status Companies (SQ1)

5. Model Specification

A Probit model is used to estimate the factors that influence whether or not an MSC-status company undertakes innovative efforts. Following Greene (2000), assume there is a latent variable, y_i^* ,that describes a firm's propensity to innovate

$$y_i^* = X_i'\beta + \mu_i$$

where X_i' is a vector of explanatory variables with the associated β vector and μ_i is the error term, which is assumed to be normally distributed. What is observed, however, is a binary variable defined as

$$y_i = \begin{cases} 1 \; if \; y_i^* > 0 \\ 0 \; otherwise \end{cases}$$

It follows that $y_i = 1$ indicates that the firm is innovative and $y_i = 0$ indicates otherwise. The conditional expectation of the binary variable y given x is, by definition, a probability:

$$E(y|x) = Pr(y = 1|x_1 \ldots . x_k) = p = \Phi(\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k)$$

where Φ represents the standard normal cumulative density function. β_i gives the marginal effect along the horizontal axis due to the increment in x. To translate this effect, the following calculation is needed

$$\frac{\partial Pr(y_i = 1|x_i;\beta)}{\partial x_{ij}} = \emptyset(x_i'\beta)\beta_j$$

In the last term, ϕ is the derivative of the CDF, which is the probability density function (PDF). Since this regression function is non-linear in nature, the Maximum Likelihood (ML) solution technique is employed in place of the usual OLS.

The ML estimation for the Probit model is given by

$$Pr(y_i = 1|x_i\beta) = \Phi(x_i'\beta) \qquad Pr(y_i = 0|x_i\beta) = 1 - \Phi(x_i'\beta)$$

Two important issues should be addressed beforehand. One is the potential endogeneity between training and innovativeness. Some may argue that the decisions on major innovations should come prior to the decisions to train workers so that they will be able to utilize an innovated technology. But according to Chowhan (2005), the inclusion of training does not present an endogeneity problem if the decision on whether or not to provide training is made ex-ante. This is when firms make training decisions, particularly training expenditures into their operations, based on past budgets while adjusting for inflation and growth. Allocating expenditures to training based on past budgets reflects historical legitimacy, emphasis on current organizational and presumed performance (Cyert and March, 1963).

The second issue, which is unobserved heterogeneity, can be dealt with in a number of ways. If panel data with repeated observations on the binary outcome of interest are available then unobserved heterogeneity is usually dealt with by either conditioning on the unobserved heterogeneity through random effects or by transforming the data to

eliminate individual-specific fixed effects (see Halaby, 2004). These methods reduce the potential parameter bias from unobserved heterogeneity. Unfortunately, in studies that rely on cross-sectional data, such as the present one, it is often difficult to deal effectively with potential bias from unobserved heterogeneity because there is only little information in the data that allows the researcher to identify and correct from the unobserved heterogeneity.

6. Variables Description

Data on innovation, training and other firm-level characteristics relevant to this study are generated from the Survey Questionnaire for the MSC-status Companies (SQ1). Innovativeness of a company is measured by its progress in undertaking a number of initiatives or 'innovative efforts' as defined in question A10 of the survey questionnaire. A list of ten initiatives was constructed based on two of Schumpeter's classification of innovation, namely, the introduction of a new product or a qualitative change in an existing product (product innovation) and process innovation new to an industry (process innovation). The companies were asked whether they had undertaken any of these innovative efforts since joining MSC Malaysia: "developed a major new product", "upgraded an existing product, "obtained patents or copyrights for products", "introduced new technology that improved production process", "certified to ISO 9000", "agreed on a new JV with a foreign or local partner", "obtained a new licensing agreement", "outsourced a major production activity that was previously in-house", "brought in-house a major production activity that was previously outsourced" or "opened a new plant or branch".[10] The respondents are allowed to choose more than one form of innovative activity and upon answering 'yes', they are further asked to rank the importance of those initiatives on their companies' growth based on a five-point Likert scale (not important to extremely important).

[10] Although ISO 9000 is essentially a TQM measure, there exists a significant relationship between TQM practices and innovation performance, as highlighted by Prajogo and Sohal (2001) in their literature review. In another study (Prajogo and Sohal, 2006), TQM has been analyzed as a mediating factor between company strategy and innovation.

For the Probit regression analysis, innovation is a binary variable that takes the value 1 if a company had undertaken the first four innovative efforts and 0 otherwise *(INNOVATION*). These items are used to define innovation because they are primarily undertaken by most MSC-status companies and are also perceived to be important for their companies' growth.

In the survey, training is measured in a number of ways, namely, by the amount of training expenditure spent, the number of knowledge workers trained, the average duration of days and hours of training, whether or not the company provides training in the last year and the existence of a formal training policy, or scheme, within the company. But for the purpose of this study i.e. to analyze whether or not training supports company innovations in MSC Malaysia, only the last measure is used (*TRAINING*), where it takes the value 1 if a company has a training policy, including those on ad hoc basis and 0 otherwise.

This measure is chosen for three reasons. Firstly, it follows the same time line as the innovation measure, that is, since the inception of the business in MSC Malaysia (assuming that the company had established a training policy right from the start). Secondly, companies with a training policy regularly train their workers (Hansson, 2005; Smith and Hayton, 1999) or are, at least, consistent in providing training to their workers. Although the existence of a training policy does not necessarily lead to an actual provision of training, there is a positive correlation between the two variables (0.251, $p<0.05$) for the current sample. Furthermore, a cross tabulation of the variables also show that almost 90 per cent of companies that have a training policy actually provide training in the last year. For the current sample, 72 per cent of the MSC-status companies have a training policy. Thirdly, while the other training measures may seem more ideal, but due to the lack or inaccuracy of data obtained from the respondents, as well as to ensure sufficient response to enable regression analysis, this measure is deemed the most fit.

Other variables used to control firm-level characteristics are described as follows. According to Schumpeter (1947), innovations are more likely to be initiated by large rather than small firms, so the size of the company (*SIZE*) as measured by total workforce at the end of December 2007 is included in the model. MSC-status companies may also be characterized by whether or not there exists any foreign ownership

(*FOWNERSHIP*) and by how long they have operated in MSC Malaysia (*DURMSC*). Innovation is also related to the level of technology usage as well as competition faced by the firm. To represent these factors, two binary variables are used with value 1 assigned to the company if it uses own technology (*OWNTECH*) and faces medium to high level of competition in the local and overseas market (*COMPETITION*), 0 otherwise. Following the literature, a workforce with high absorptive capacity too is an important source of innovation. In this analysis, such variable is measured by the workers' level of adaptability (*ADAPTABLE*) and higher education (*GRADUATE*). The former is measured by how fast new recruits are able to perform their jobs as well as more experienced workers already in the company whereas the latter refers to the share of knowledge workers with a degree or higher qualification.

7. Results

Descriptive Statistics

Table 3 presents the incidence of innovation among MSC-status companies since joining MSC Malaysia. The percentage of companies that undertake each initiative ranges from 56 per cent to 94 per cent, indicating that most MSC-status companies are innovative. The majority of respondents perceived the first four innovative efforts to have either a "very important" or "extremely important" impact on their companies' growth. These efforts include the "development of a major new product", "upgrade of an existing product", "patents or copyrights for a product" and "introduction of a new technology that improved production process". The remaining six initiatives are not that popular among the respondents and those who did viewed those efforts as "not important" or just "fairly important" on their company growth.

Regarding the link between training and the companies' innovative efforts, a simple computation of the relative frequency suggests that when a training policy is in place, it not only positively influences innovation but innovation seems to be more important to the growth of the MSC-status company. From Table 4, it can be seen that for the first four innovative efforts that greatly affect the companies' growth, all but one instance are undertaken more when the company has a training policy. An interesting pattern is also found for the least popular

innovative efforts, where their absence seem to occur more among companies that have no training policies. For instance, 37 per cent of companies with a training policy did not certify to ISO 9000 compared to 42 per cent of their counterparts with no training policy.

Table 3. Innovation undertaken by MSC-status companies

	Importance to the Company's Growth						
Innovative efforts taken	Not important	Slightly important	Fairly important	Very important	Extremely important	Not Taken	Total
Developed a major new product or line of service	4 *4.1*	3 *3.1*	20 *20.4*	31 *31.6*	34 *34.7*	6 *6.1*	98 *100.00*
Upgraded an existing product or line of service	5 *5.1*	0 *00.0*	16 *16.3*	45 *45.9*	24 *24.5*	8 *8.2*	98 *100.00*
Obtain patents or copyrights for the company products	12 *12.2*	9 *9.2*	11 *11.2*	25 *25.5*	16 *16.3*	25 *25.5*	98 *100.00*
Introduced new technology that improved production process	7 *7.1*	4 *4.1*	17 *17.3*	32 *32.7*	23 *23.5*	15 *15.3*	98 *100.00*
Certified to ISO 9000	27 *27.6*	11 *11.2*	8 *8.2*	8 *8.2*	7 *7.1*	37 *37.8*	98 *100.00*
Agreed on a new JV with a foreign or local partner	13 *13.3*	11 *11.2*	19 *19.4*	18 *18.4*	11 *11.2*	26 *26.5*	98 *100.00*
Obtained a new licensing agreement	21 *21.4*	10 *10.2*	13 *13.3*	19 *19.4*	6 *6.1*	29 *29.6*	98 *100.00*
Outsourced a major production activity that was previously in-house	24 *24.5*	7 *7.1*	11 *11.2*	10 *10.2*	3 *3.1*	43 *43.9*	98 *100.00*
Brought in-house a major production activity that was previously outsourced	22 *22.4*	6 *6.1*	15 *15.3*	13 *13.3*	3 *3.1*	39 *39.8*	98 *100.00*
Opened a new plant or branch	26 *26.5*	14 *14.3*	10 *10.2*	10 *10.2*	6 *6.1*	32 *32.7*	98 *100.00*

Note: Percentage is in italics; “product” includes both good and services

Table 4. Cross tabulation on training and innovative efforts

		Training policy in place		
		Yes (N=71)	No (N= 27)	Total (N=98)
Developed a major new product	Not important	3 (4.2)	1 (3.7)	4 (4.1)
	Slightly important	2 (2.8)	1 (3.7)	3 (3.1)
	Fairly important	15 (21.1)	5 (18.5)	20 (20.4)
	Very important	20 (28.2)	11 (40.7)	31 (31.6)
	Extremely important	28 (39.4)	6 (22.2)	34 (34.7)
	Not taken	3 (4.2)	3 (11.1)	6 (6.1)
Upgraded an existing product	Not important	2 (2.8)	3 (11.1)	5 (5.1)
	Fairly important	10 (14.1)	6 (22.2)	16 (16.3)
	Very important	34 (47.9)	11 (40.7)	45 (45.9)
	Extremely important	20 (28.2)	4 (14.8)	24 (24.5)
	Not taken	5 (7.0)	3 (11.1)	8 (8.2)
Obtain patents or copyrights for a product	Not important	9 (12.7)	3 (11.1)	12 (12.2)
	Slightly important	8 (11.3)	1 (3.7)	9 (9.2)
	Fairly important	6 (8.5)	5 (18.5)	11 (11.2)
	Very important	19 (26.8)	6 (22.2)	25 (25.5)
	Extremely important	14 (19.7)	2 (7.4)	16 (16.3)
	Not taken	15 (21.1)	10 (37.0)	25 (25.5)
Introduced new technology that improved production process	Not important	4 (5.6)	3 (11.1)	7 (7.1)
	Slightly important	2 (2.8)	2 (7.4)	4 (4.1)
	Fairly important	8 (11.3)	9 (33.3)	17 (17.3)
	Very important	27 (38.0)	5 (18.5)	32 (32.7)
	Extremely important	20 (28.2)	3 (11.1)	23 (23.5)
	Not taken	10 (14.1)	5 (18.5)	15 (15.3)

Note: Percentage in parentheses

Regression Results

Two specifications of the hierarchical Probit model are adopted; the first controls for the firm characteristics while the second model includes the training variable. Both models are estimated using robust standard errors. The pseudo R^2likelihood ratio and Hosmer-Lemeshow test statistics support a sound fit of the model. The results of the Probit regressions are presented in Table 5.

Without training, the propensity to innovate is higher among smaller MSC-status companies (p<0.1), those facing medium to high level of competition in the market (p<0.01) and those with an adaptable workforce (p<0.1). The inclusion of the training variable improves the fit of the model slightly. As expected, training has a significant and positive impact on the company's propensity to innovate, but this effect is only significant at the 10 per cent level. With training added to the model, two other factors became significant in influencing the

company's propensity to innovate, namely, the existence of foreign ownership and the share of graduates in the workforce (both at $p<0.1$).

While all the variables follow the expected signs, interestingly, the effect of company size does not seem to adhere to theory in that smaller MSC-status companies are more likely to be innovative than bigger companies.[11] It is plausible that this is due to the overwhelming share of SMEs in the sample (83 per cent). A cross tabulation between innovation and company size also reveal that smaller companies involve in more innovative efforts compared to larger firms. Additionally, it might seem strange that foreign companies tend to innovate less than their local counterparts in MSC Malaysia. While there is no clear explanation of this matter, it may be assumed that given the competitive nature and high technological content of the knowledge-based industry, firm ownership may not bear that much difference in the companies' desire to perform well. In fact, local MSC-status companies may inevitably work harder than their peers to prove their worth in attracting investors.

The potential problem of endogeneity bias is recognized in the model. This issue arises when a firm trains its workers because of an innovation that requires new skills of the firm's workforce (reverse causality). To reduce this problem, the training variable is measured by the existence of a training policy, which was assumed to have existed since the inception of the company in MSC Malaysia. Related to this problem is sample selection bias, which refers to where the dependant variable is observed only for a restricted, non-random sample. In this case, one observes a firm's innovative propensity only if the firm provides training for its workers

[11]Similar result is found when company size is measured by total revenue (turnover). This finding, however, is in line with Schumpeter's (1934) earlier hypothesis that small firms are best at innovating.

Table 5. Estimation coefficients and marginal effects

	Model 1		Model 2	
Independent Variables	B	Exp(B)	B	Exp(B)
CONSTANT	-1.001*	0.368	-1.501**	0.223
	(0.607)		(0.651)	
SIZE	-0.003*	0.997	-0.003**	0.997
	(0.002)		(0.002)	
FOWNERSHIP	-0.449	0.638	-0.546*	0.579
	(0.299)		(0.301)	
DURMSC	0.061	1.063	0.054	1.055
	(0.047)		(0.046)	
COMPETITION	0.831***	2.296	0.819***	2.268
	(0.315)		(0.314)	
OWNTECH	0.514	1.672	0.499	1.647
	(0.315)		(0.314)	
ADAPTABLE	0.503*	1.654	0.558*	1.747
	(0.298)		(0.308)	
GRADUATE	0.784	2.190	1.05*	2.858
	(0.595)		(0.602)	
TRAINING			0.558*	1.747
			(0.305)	
N	96		96	
H-L statistic[a]	10.357		7.332	
Prob (H-L stat)	0.241		0.501	
LR statistic	13.595		16.501	
Prob (LR stat)	0.059		0.036	
McFadden R^2	0.116		0.140	

8. Conclusion

This study utilized data from an online survey to, firstly, examine the innovative efforts undertaken by knowledge-based companies in Malaysia and, secondly, to investigate whether or not training has any impact on those innovative efforts. From the survey, it was found that innovation was evident among the vast majority of the knowledge-based companies, particularly in the "development of a major new product", an "upgrade of an existing product", "patents or copyrights for a product" and the "introduction of a new technology that improved production process". A simple crosstab analysis suggests that when a training policy is in place, it not only positively influences innovation to take place within the company but innovation seems to be more important to the growth of the companies. In addition, the result of the regression analysis shows that training has a significant and positive impact on the company's propensity to innovate.

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