

## Profiles of Entrepreneurs and Their Start-ups in the UPM-MTDC Incubation Center

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### ABSTRACT

*In this study, nine entrepreneurs whose companies were located in the UPM-MTDC Technology Incubation Center were interviewed. The objective was to examine certain key characteristics of the firms (those related to their business activities) and of the entrepreneurs (characteristics related to their motivations and demographic backgrounds). This study revealed a number of similarities between the characteristics of these entrepreneurs and the characteristics reported in studies of their counterparts in the US and the UK. Similarities included the common use of personal savings as sources of capital for starting up their businesses; the fact that start-up of the new ventures was initiated by entrepreneurial teams; problems in acquiring capital, particularly during their growth stage; and that all the entrepreneurs had at least a 4-year bachelors degree. Nevertheless, the study also revealed differences between business support services available at UPM-MTDC and those found in business incubators in the US. For example, compared to the incubators in the US, UPM-MTDC does not provide many of the services required by a business, and there is a lack of utilization of university resources, as well as a lack of linkage with other resources and contacts in the industry in which a given business is working.*

### ABSTRAK

*Di dalam kajian ini, sembilan usahawan yang memiliki syarikat yang beroperasi di pusat pengeraman perniagaan UPM-MTDC telah ditemuduga. Tujuan kajian adalah untuk mengenalpasti ciri firma (iaitu ciri yang berkaitan dengan aktiviti perniagaan firma) dan latar belakang usahawannya (iaitu ciri yang berkaitan dengan motivasi dan latarbelakang demografi mereka). Kajian mendapati terdapat beberapa persamaan berkenaan dengan latar belakang usahawan syarikat dalam kajian ini dengan usahawan yang beroperasi di Amerika Syarikat. Antara persamaan tersebut termasuk penggunaan wang simpanan peribadi sebagai sumber kewangan untuk memulakan usaha niaga, usaha niaga dibentuk oleh sekumpulan usahawan, usahawan mengalami masalah mendapatkan bantuan kewangan terutamanya dalam fasa pertumbuhan dan semua usahawan memiliki sekurang-kurangnya ijazah sarjanamuda. Walau bagaimanapun, kajian ini mendapati terdapat*

*perbezaan dari segi bantuan perkhidmatan perniagaan yang disediakan di pusat peneraman perniagaan UPM-MTDC dengan pusat yang serupa di Amerika Syarikat. Contohnya, berbanding dengan pusat peneraman di Amerika Syarikat, UPM-MTDC tidak menyediakan kebanyakan bantuan perkhidmatan perniagaan yang diperlukan oleh sesebuah perniagaan dan tahap penggunaan sumber-sumber dari universiti, juga hubungan dengan sumber dan agensi lain dalam industri masih rendah.*

## INTRODUCTION

Small high technology-based firms (SHTFs) that exist for the purpose of generating technological innovations are an important component in wealth creation and economic development in societies (Tether 2000). This is because, inventions that come out of these firms, when successfully commercialized, not only bring wealth to the inventors and their partners as the firms grow, but also provide employment to others in the society (Jones-Evans and Westhead 1996). Furthermore, when the delivered innovations are put to proper use, they usually benefit the society at large.

Recognizing the crucial role of the high technology industries in the country's transformation into a highly industrialized nation, the Malaysian government has aggressively implemented a number of support infrastructures to promote the creation and development of SHTFs. Such efforts have grown especially since the mid-1990s. The vanguard project is the Multimedia Super Corridor (MSC), which is a designated area incorporating most, if not all, of the infrastructure necessary to nurture the creation of high technology industries (Ramasamy, Chakrabarty & Cheah 2003). Within the MSC, several business incubators have been established specifically to serve as seedbeds for small high technology businesses. In addition, the businesses that are located there are given financial incentives and other needed assistance ([www.msc.com.my](http://www.msc.com.my)).

The importance of these efforts is shown by the increase in recent years in the number of small high technology firms. Further, the involvement of these businesses in IT-related work has resulted in the creation of an export market for Malaysian IT products—a market that had been non-existent previously (Hizamnuddin 2001). More recently, it was reported that there was an increase in the number of jobs created by firms operating within the MSC, from 17,000 in 2002 to 17,854 in May 2003 (Hizamnuddin 2003).

Our review of the literature found only a small number of research studies that had focused on entrepreneurial SHTFs (March & Gunasekaran 1999), although entrepreneurs are recognized as significant players in promoting technological innovations. Our review of the literature also showed that studies which examined SHTFs particularly in the Malaysian business scene, whether in a business incubator setting or elsewhere, were

lacking. This has resulted in a lack of understanding about the businesses of these new ventures, the characteristics of the entrepreneurs who operate them, and the technologies they invented and developed. This study is among the first to research SHTFs operating in Malaysia. It examined start-up companies located in the UPM-MTDC business incubator, which is the first university-based incubator in Malaysia. The objective of this study was to generate profiles of the incubator tenants in terms of the characteristics of the businesses and of the entrepreneurs who operate them.

The next section of this paper gives an overview of the UPM-MTDC business incubator followed by a review of studies on the characteristics of small business firms and entrepreneurs. The research methodology employed in this study is described and the findings are discussed. Some recommendations for both current practice and future research are also provided.

### THE UPM-MTDC TECHNOLOGY INCUBATION CENTER

The UPM-MTDC Technology Incubation Center is a joint-venture project between Universiti Putra Malaysia (UPM) and the Malaysian Technology Development Corporation (MTDC), a venture capital company. The incubator, established in late 1996, was the first of several MTDC technology business incubators to be instituted on Malaysian university campuses. The incubator purpose is to provide an infrastructure for the development of the university's spin-off companies, and at the same time it utilizes the university's vast resources to support the creation and development of other new entrepreneurial ventures. This incubator is intended to accommodate primarily high technology ventures involved in information technology and multimedia businesses. The UPM-MTDC Technology Incubation Center has a capacity of 30 tenants, and as of mid-2002 there were 27 in residence (Interview with Norhayati Ahmad, Marketing Executive of Technology Incubation Management, MTDC, in June 2002. You may view MTDC's website at [www.MTDC.com.my/tc/UPM.htm](http://www.MTDC.com.my/tc/UPM.htm) for additional details.)

The UPM-MTDC business incubator is located within the Multimedia Super Corridor (MSC), a special geographical region set aside by the Malaysian government and equipped with support infrastructures to nurture new high technology businesses as well as to attract already-established ones. Having been awarded a 'Cybercity' status, the UPM-MTDC incubator is designated to accommodate high technology companies that have qualified as MSC-status companies. Currently, there are five such designated Cybercities: Cyberjaya Flagship Zone, Technology Park Malaysia (Phase 1 only), UPM-MTDC, Petronas Tower, and KL Tower ([www.msc.com.my](http://www.msc.com.my) and Ramasamy et al. 2003).

For companies, attaining MSC-status is a passport for access to certain amenities available therein - both financial ones (e.g., tax exemptions) and non-financial ones (e.g., access to certain high technology-related business support services). These nurturing mechanisms increase the chances for success of new venture firms, and also attract more established firms to apply for a space within the MSC area. The aim is to create what Michael Porter (1998) refers to as a "cluster" of high technology companies, along with supporting agencies and businesses, in a particular location. (Silicon Valley in the US is a well-known example of such a high technology cluster.) This arrangement allows high technology industries to prosper in a country, even when the general public-and business world-may not yet be ready to use the latest technology to a great extent. Since all companies which obtain the MSC-status license are required to locate their head office and/or to conduct their principal activities in offices located within the designated Cybercity vicinity, the UPM-MTDC business incubator's close proximity to the Kuala Lumpur City center gives it an edge in attracting high technology firms ([www.msc.com.my](http://www.msc.com.my) and Ramasamy et al. 2003).

## LITERATURE REVIEW

A number of researchers have examined the business characteristics of small firms, e.g., March and Gunasekaran (1999) and Lee and Osteryoung (2001) and the characteristics of the entrepreneurs who operated them, e.g., Lee and Osteryoung (2001). Specifically, March and Gunasekaran (1999) examined business characteristics of new high technology ventures, while Bruton (1998), after having analyzed the literature on the support infrastructure provided by business incubators in the US, examined high technology entrepreneurs who operated within an incubator setting in Russia, and also studied the supporting structure of the incubator. In studying the characteristics of small firms, March and Gunasekaran (1999) utilized 23 variables in describing the operations of new high technology ventures. All of these variables described the business operations of the firms, four of which are related to the firms' innovations. Lee and Osteryoung (2001) examined the types of ownership and the location of the firms studied.

In profiling entrepreneurs, Lee and Osteryoung (2001) examined the entrepreneurs' age, gender, and educational and occupational background. Bruton's (1998) review of literature on business incubators in the US found that most of the entrepreneurs had earned a bachelor's degree. The notion that "life begins at forty" may be true in this context, because that was the average age of entrepreneurs at these incubator companies when they started their respective businesses.

In discussing occupational background of high technology entrepreneurs, Jones-Evans (1995) classified entrepreneurs into four categories: researcher, producer, user and opportunist (Table 1).

As noted in Table 1, 'researcher' entrepreneurs work experience had been concentrated in research fields, and depending on whether they have work exposures in industrial settings, could be classified into either pure researchers or researcher-producers. 'Pure researcher' entrepreneurs were those who do not have any industrial experience and work in research-based organizations throughout their entire working life before founding the new venture. On the other hand, 'Researcher-Producer' entrepreneurs were those whose work experience had been primarily in research-based organizations, with only a short stint in industry, either prior to joining the research-based institutions (i.e. industrial scientists) or after that (i.e. academic researcher).

'Producer' entrepreneurs were those who worked entirely within an industry setting prior to starting up a new venture and their work experience had been within the technical functions. 'Users' were entrepreneurs whose previous dealings with technology were only in supporting functions, or previously had been only the end users of the technology now being further developed. 'Opportunist' entrepreneurs were those whose work experience are not directly related to the core technology of the new venture businesses, but had acquired technological know-how on their own, from other sources.

Another entrepreneur profile variable that has received researchers' attention is the entrepreneur's motivations for starting up their new ventures. Attahir's (1995) findings demonstrated that both extrinsic factors (e.g., to meet demand) and intrinsic factors (e.g., to satisfy one's own financial needs) were important motivators. On the other hand, Zapalska (1997) highlighted only intrinsic variables in her study. Zapalska (1997) found that the prime motivators among the Polish entrepreneurs she studied were to be more able to manage their own lives, to ensure employment, and to gain self-satisfaction.

Problems faced by entrepreneurs have also received attention from researchers. One of the problems faced by entrepreneurs is capital acquisition (in the US, Van Auken 2001, in the UK, Keogh & Evans 1999; and McNally 1995). McNally (1995), based on his literature review, pointed out that this problem is most often encountered in the early growth stage of the firm, and attributed capital acquisition problems to the newness of the firms' products in the market.

*The Economist* (Feb. 2000), reported in its study which had examined Malaysia and other Asian countries in terms of the growth of high technology ventures, and pointed out that although certain support infrastructures may be put in place through the establishment of MSC, Malaysian entrepreneurs faced problems in terms of consumer markets being still small and so far showing a slowness in acceptance of new technology; a shortage of creative

TABLE 2 Profiles of entrepreneurs and their start-ups, located in the UPM-MTCD Technology Incubation

Firm	Main business	Legal form of organization	Year incorporated	Sources of initial capital	Main customers	Single owner vs entrepreneurial team managers	Motivations for setting up the business	Educational Background	Occupational Background	Age (at start-up)
A	Software developer and systems integrator	Private limited company	1996	Personal savings	Local, has plans to go abroad	Single owner manager	Intrinsic + extrinsic factors	Bachelor degree	Industrial	34
B	Multimedia education and training	Private-limited company	1997	Personal savings	Local	Entrepreneurial team managers	Intrinsic + extrinsic factors	Bachelor degree	Industrial	35
C	Systems integrator Hardware manufacturer and software developer	Private limited company	1997	Personal savings and borrowings from family members	Local, has plans to go abroad	Single owner manager	Intrinsic + extrinsic factors	Bachelor degree	Industrial	32
D	Software developer	Private limited company	1996	Personal savings	Local and overseas	Entrepreneurial team manager	Intrinsic + extrinsic factors	Bachelor degree	Industrial	40
E	Software developer	Private limited company	1997	Personal savings and state government fund	Local, has plans to go abroad	Single owner manager	Intrinsic + extrinsic factors	Bachelor degree	Industrial	38

TABLE 2 *Cont*

Firm	Main business	Legal form of organization	Year incorporated	Sources of initial capital	Main customers	Single owner manager vs entrepreneurial team managers	Motivations for setting up the business	Educational Background	Occupational Background	Age (at start-up)
F	Software developer	Private limited company	1998	Personal savings	Local, has plans to go abroad	Single owner manager	Intrinsic + extrinsic factors	Ph D	Industrial	44
G	Software developer	Private limited company	1994	Personal savings	Mainly overseas	Single owner manager	Intrinsic + extrinsic factors	Masters degree	Industrial	35
H	Software developer, systems integrator, Internet-infrastructure provider	Private limited company	1996	Personal savings	Local, has plans to go abroad	Entrepreneurial team managers	Intrinsic + extrinsic factors	Bachelor degree	Industrial	35
I	Software developer and systems integrator	Private limited company	1996	Personal savings	Local, has plans to go abroad	Single owner manager	Intrinsic + extrinsic factors	Bachelor degree	Industrial	34

their businesses by adding new business portfolios and exiting certain businesses, but all the firms continued to maintain their primary business activities. Sometimes the decision to expand to new businesses or new markets had to be made due to prevailing unfavourable economic conditions. For example, at least two companies were directly affected by the 1997 financial crisis, which resulted in one moving to new markets (Company E), and another to vertically integrate into a new business (Company H). Company E, which was primarily a solution provider to government agencies, had to let its government customers go because of the financial crisis. The crisis had forced severe budget cuts in IT by government agencies, and they could no longer pay for Company E's products. As a result, the company became a solution provider to higher education institutions and private companies. On the other hand, Company H decided to venture into Internet-based infrastructure operations because this business (at least at the time they made the move), was less subjected to the vagaries of economic cycles. In other firms, rapid changes in technology development became the main reason for expanding and/or evolving into other businesses or markets.

*Type of Legal Organization, Years in Operation, Number and Average Age of Employees* All sampled companies were incorporated as private limited and all have been in operation since the mid-1990s, and as such were riders of the dotcom waves. The number of employees in these companies ranged from ten to 45, with the mean age being thirty years old.

None of the companies interviewed were spin-offs from UPM's research and development activities or other university-industry partnership ventures. It was also found that there was no collaboration between the start-up companies and either the host university or any other university. The only relationship found was that some of the businesses used UPM students for clerical and data entry work.

*Sources of Initial Capital* All the entrepreneurs interviewed took their seed capital from personal savings. One also borrowed from family members. However, in financing their growth, all sought bank loans and various types of grants.

*Main Customers* Seven of the companies sold strictly to local customers, while one had a mixture of local and overseas customers and one mainly sold abroad. Companies with local target markets did have the intention of eventually marketing their products and services abroad, and those already serving overseas markets had plans to expand further. As part of their marketing efforts, all entrepreneurs had at one time or another participated in overseas exhibitions. The main obstacle to venturing abroad, as mentioned by one entrepreneur, was the difficulty of penetrating the market of developed

countries, because of the high level of technological sophistication that exists in those countries. Therefore, selling to less-developed countries became their focus.

In terms of the size of customer companies, six of the new entrepreneurial businesses sold to both small and medium-sized enterprises and to large companies, while one firm sold to small and medium-size companies only. Two other companies specifically sold only to large companies mainly because of product-specific reasons. (One of these firms had established a life-long contract with a major telecommunications company from the beginning of its inception, and another company dealt with products that only meet the needs of large companies.)

#### PROFILE OF ENTREPRENEURS

*Single Manager vs. Entrepreneurial Team Managers* More than one person was involved in the initial setting up of each of the UPM-MTDC tenant companies that were studied. However, in six firms, even though more than one individual were involved in the setting up of the company, only one person was now actually running the company. Other companies were being managed by entrepreneurial teams, with the number of members varying from two to four. Interestingly, the types of expertise or occupational background and the age of the team members were quite diverse. For instance, Company B's entrepreneurial team comprised two persons, Mr. B1 and Mr. B2. Mr. B1 was from a marketing/technical sales background and was in his 50s when starting the business; Mr. B2 was from a technology development/manufacturing background and was in his 20s at the time the business was established.

All the entrepreneurs studied are Malaysians except for two. One of the two non-Malaysians comes from a European country and the other is from a Southeast Asian country. These foreign operators revealed that they were attracted to running their businesses in the UPM-MTDC business incubator because of cheaper overheads and proximity to their customers.

*Motivations for Starting Up a New Business* The findings revealed that eight of the entrepreneurs identified the simple presence of a promising business opportunity as their reason for initiating a business. Three stated that their reason for starting up a new business was that they could not work under someone else. All entrepreneurs agreed that the need for self-satisfaction, freedom, and flexibility, plus the desire to achieve personal growth, were main motivators for the launching of their respective businesses. Additionally, for two entrepreneurs, the start-up of their businesses occurred around the same time as the introduction of the MSC, which identifies government encouragement as a key motivator.

*Educational and Occupational Background, and Age* All of the entrepreneurs interviewed had at least a bachelor's degree; seven had concentrated study in the sciences and engineering. An interesting finding was that seven entrepreneurs obtained their first degree overseas. All the entrepreneurs had had previous experience working in an industrial setting. The specific kinds of work were mostly related to their respective undergraduate specializations. One of them had worked as a general manager in a large corporation.

The average age of the entrepreneurs when starting their businesses was thirty-six years old, with the youngest being thirty-two, and the oldest forty-four. (The age for entrepreneurial teams was calculated by averaging together the ages of all the members).

*Problems Faced by These Entrepreneurs* These entrepreneurs reported that they faced difficulty in attaining funds from venture capital companies and other credit institutions, specifically in their quest to secure grants to assist their companies during the growth period. Other than financial problems, there was stiff competition. According to the entrepreneurs interviewed, as a result of the implementation of various incentives and support infrastructure for high technology firms, especially in the recent years, their numbers have quickly multiplied. This resulted in many SHTFs facing intense competition. In addition, the financial turmoil that had hit the ASEAN region had resulted in cancelled contracts, thus disrupting the cash flow of these companies. This in turn had forced at least two entrepreneurs to downsize and/or close down non-performing departments.

Other problems faced include difficulty in obtaining "qualified" people, and high employee turnover rates. Two entrepreneurs stated that skilled and qualified workers are scarce and hard to find in Malaysia. According to one entrepreneur, this problem could be attributed to lack of adaptation to the rapidly changing developments in technology among the local graduates, primarily due to their lack of interest in learning new things and/or their poor command of English.

The shortage of skilled workers is compounded by a high attrition rate within the high-technology industry. According to entrepreneurs of Companies C, F, and G, most of the job applicants and employed workers treat SHTFs as a training ground for gaining experience and expertise before joining larger local or multinational corporations. The high attrition rate caused one company to have delays in its delivery of products to clients, thus hurting the company's bottom line and image. In an effort to overcome some of the problems related to high employee turnover, one firm adopted a stringent recruitment policy, requiring all prospective employees to undergo several levels of interviewing.

Finally, due to the technical nature of SHTFs, many of the managers and executives of these companies failed to perform well as marketers. Most of

the time the owners themselves had to do the leg work to secure contracts and deals, both locally and overseas.

## CONCLUSIONS

Our findings that revealed all entrepreneurs took their seed capital from personal savings are consistent with those found by McNally (1995). From his review of the literature, McNally (1995) summarized that the sources of capital for US technology-based firms were mainly derived from the entrepreneur/founder personal savings and borrowings from family members. Results from the present study regarding the fact that all of these Malaysian ventures were initiated by a group of people, as opposed to any one individual, compares with findings by Kamm et al. (1990), who from their review of literature observed that entrepreneurial teams, instead of a single entrepreneur, started up to 71% of US high technology businesses. Problems pre-eminent to Malaysian entrepreneurs are also not unique. They faced similar predicaments to their US (Van Auken 2001) and UK (McNally 1995; Keogh & Evans 1999) counterparts in getting funding, specifically during the growth stage.

Another finding which is in line with previous literature (e.g. Attahir, 1995) is motivation for starting up a new business. We found that the prime motivator for starting up new businesses among our subjects of study was a combination of both intrinsic factors (e.g., need for self-satisfaction), and extrinsic factors (e.g., availability of business opportunity and government incentives).

In regard to the research literature on high technology entrepreneurs, this study has revealed a need to include more categories under occupational backgrounds, to enable the inclusion of a more realistic and comprehensive range of work experience categories common to entrepreneurs. Following the Jones-Evans' (1995) classifications of entrepreneurs, which were based on occupational backgrounds, all entrepreneurs that we studied had experience working in an industrial setting, and thus would be classified as "Producer" types. We found that one of our entrepreneurs had work experience both in academic and in industry, prior to founding his own firm. But unlike "Researcher-Producer" types of entrepreneur (according to the Jones-Evans classifications), this entrepreneur worked for the most part in an industrial setting, and spent only his first few years of working life being employed in a university setting (rather than vice versa). This highlights the need to revise the categories of entrepreneurs to include those who had such work experience characteristics, and perhaps other combinations not yet encountered.

Our study also found that entrepreneurs might have multiple occupational backgrounds. For instance, a person may move from careers in research to

management, and then go on to become a general manager. We found that the above-mentioned entrepreneur had first a brief attachment to a university before he served as a scientist for a number of years in two different organizations. Then, the entrepreneur made a switch to a managerial career ladder and was eventually promoted to a general manager for a large corporation, which was his last designation prior to founding his own company. This represents the need to include at least one other category under occupational background of entrepreneurs, namely, “Scientist-turned Manager” entrepreneurs. This is to enable researchers to compile a more accurate account of the work experience of entrepreneurs examined in future research.

In general, findings from this study can serve as a basis for comparison for other researchers who may study entrepreneurial new ventures within an incubator setting in Malaysia. Specific findings can serve as preliminary groundwork for investigating further issues concerning high tech entrepreneurship and the management of new ventures. For example, further research needs to be done to examine the existing Malaysian venture capital industry and to propose solutions to identified problems—such as the obtaining of funds, which poses such a challenge for SHTFs. Addressing issues in regard to funding problems will help ensure the sustainability of the country’s technology-based businesses.

Our findings conclude that the entrepreneurs must have intrinsic factors such as the need for self-satisfaction, freedom, and flexibility, and must deal with extrinsic factors such as government incentives and current business opportunities in creating and then sustaining their operations. This understanding should be important to both policy makers and would-be entrepreneurs. While the policy makers need to provide the kinds of support necessary for the creation and sustainability of high-technology businesses, potential entrepreneurs must make themselves aware of possible business opportunities. The information that most entrepreneurs have been using their personal savings for seed money should serve as a warning for entrepreneurs that they must have ample savings before starting up new ventures, or else must find new creative means for obtaining funds.

The fact that all the entrepreneurs in this study have at least a bachelor’s degree supports the findings of Bruton (1998), whose review of the literature discovered that most entrepreneurs who were established within business incubators in the US also had a bachelor’s degree, and from his own study which found that all entrepreneurs operating in Zelenograd Scientific and Technology Park, an incubator in Russia had university degrees. We may conclude that while having a university degree may not be essential to succeed in a new high-tech venture (as we see in the case of some in high-tech industries who have no degree and have become rich tycoons), nevertheless, gaining a basic foundation in science and technology through

earning a college degree may help a person to qualify for the paid work that in turn enables that person to accumulate enough savings to become an entrepreneur. Of course it may be important and helpful in other ways as well, after the new business is launched, but the evidence is not available to tell US to what degree that may be true.

The fact that the entrepreneurs in this study earned their first degree overseas requires that future studies should be undertaken to see whether the origin of the first degree correlates with the level of entrepreneurial drive and ultimate success. Nevertheless, the average age of these Malaysian entrepreneurs is younger than the age (40 years old) of their US counterparts in similar studies (Bruton 1998). Although this might seem to indicate that Malaysian entrepreneurs are more ambitious at an earlier age, the more important issue may be whether their new ventures are sustainable over the long run - which would seem to depend on the level of 'quality' management they are able to provide. Although not stated in Bruton's article, the reason for the high average age of US entrepreneurs could be because of the larger presence of 'senior' partners. It seems logical that the composition of the typical management team should include partners who have plenty of experience in an industrial setting, a factor, which has been found to be one of the most important determinants of success for entrepreneurial ventures (Timmons 1994). In our study, we found two companies whose management teams included a few members who were much older than others. Future studies should investigate the composition of management teams of the high-tech ventures in Malaysia, to study whether entrepreneurs see it as important to involve 'senior' people in their start-ups, whose experience may improve their chances of 'making it.'

This study has implications for the management practices of incubator firms. Although interviews with the entrepreneurs revealed that the UPM-MTDC business incubator is preferred at least over the other two Cybercity-status business incubators, Technology Park Malaysia and MSC Central Incubator, due to its proximity to the city center and its well-established infrastructure, we are surprised to find that unlike incubators in the US, the rents charged at the UPM-MTDC are much higher than those within the surrounding neighborhood, and the incubator does not provide general business and office assistance, which are considered basic "must-have" services within incubators elsewhere (Bruton 1998). Furthermore, we found that there is no collaboration between the start-up companies and the host university; and that companies spun-off from the university's research units are not represented in the business incubator, either. Thus, this business incubator mainly provides just the physical facilities for start-up companies, does not provide the linkages necessary for sharing of resources between the university and the incubator tenants, and it was not the chosen platform among the researcher-inventors within UPM or any other university research

labs in commercializing their inventions. This arrangement differs from those found in technology business incubators associated with American universities, where sharing of resources between industry and the university is clearly demonstrated. Moreover, in contrast to UPM-MTDC, incubators located within or near American university campuses are primary hatching grounds for university-based research. In fact, technology commercialization was the major reason for establishing university-based incubators there (see Bruton 1998 for a complete review). It would seem therefore that the potential benefits associated with establishing a business incubator on UPM campus have not been fully realized. Future research should investigate other Malaysian business incubators to ascertain whether such projects are incubators only in a superficial sense, rather than projects that are providing genuinely effective support for the creation and development of the country's new high-tech ventures.

Additional implications of the study for policy makers are regarding the need to establish a highly-skilled labor pool in Malaysia, since success for SHTFs depends so much on the intellectual capacity of their workers. In order to develop such a pool, creating an education system that incorporates certain features found in the education systems of countries that have a highly skilled and knowledgeable workforce, such as the US and Japan, should be a high priority for this country. The policy makers should also address the problem of poor adaptability to cutting-edge technology and English language proficiency among local graduates, since the tenants of the business incubators must rely on the local pool of employees. As the nation is gearing up to achieve an industrialized state, a workforce that has not mastered the state-of-the-art technology and English language is seen as a handicap, a problem to overcome.

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