UNIVERSITI PUTRA MALAYSIA

EFFECTS OF TECHNOLOGY TRANSFER ON MALAYSIAN-BASED ELECTRONIC FIRMS

CHUBASHINI SUNTHARALINGAM

GSM 1999 2

EFFECTS OF TECHNOLOGY TRANSFER ON MALAYSIAN-BASED ELECTRONIC FIRMS

By

CHUBASHINI SUNTHARALINGAM

Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in the Malaysian Graduate School of Management Universiti Putra Malaysia

April 1999

To my dearest parents.....

"If I were to pass through this way again, let it be through your blessings"

Acknowledgements

Firstly, I wish to record my most sincere gratitude to Assoc. Prof. Dr. Zainal Abidin Mohamed for supervising my work with keen interest. I am also grateful to Dr. Mohd. Zain Mohamed and En. Kusairi Mohd Noh for their co-supervision.

I am truly thankful to the Malaysian Government for granting me a research fellowship under the PASCA scheme. Special appreciation is due to the Malaysian Graduate School of Management for use of their facilities, especially in completion of this thesis.

My appreciation is extended to Dr. Indah Susilowati (Faculty of Economics and Management, UPM) for her resourceful input on segments of my data analyes, Pn. Saeonah (Ministry of Science, Technology and Environment) for her kind assistance during my literature search, Mr. Law Siong Hook (Faculty of Economics and Management, UPM) for his counsel on statistical computation, Mr. Tee Keng Kok (Faculty of Economics and Management, UPM) for graphic assistance during my thesis defense, and Mr. Elayppen Muthusamy and Mr. Kelvin Simon for their generous efforts in getting respondents for my survey. Indeed, I am very appreciative to all the respondents, who participated in my survey, for their valuable cooperation.

Noteworthy appreciation is due to Ms. Sutha (CN Corporate Network Sdn Bhd) for not only a caring friend but also for her commendable aid when sourcing for critical information. On the same note, I thank Ms. Wong Foong Yee (Faculty of Economics and Management, UPM) for her propitious friendship and for lending me useful books and materials, which helped converge my thoughts when discussing my results.

I am ever grateful to my beloved parents for their blessings and constant encouragement, and to my brother for his brotherly support during those difficult

moments of my graduate work. Last but not least, I thank Siva for being a source of motivation whenever my chips were down.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

IT	Information Technology

ABSTRACT

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in partial fulfilment of the requirements for the degree of Master of Science.

EFFECTS OF TECHNOLOGY TRANSFER ON MALAYSIAN-BASED ELECTRONIC FIRMS

By

CHUBASHINI SUNTHARALINGAM

April 1999

Chairman : Associate Professor Zainal Abidin Mohamed, Ph.D .

Faculty : Malaysian Graduate School of Management

This study was carried out to determine effects of technology transfer on Malaysian-based electronic firms by examining whether the factors found to be inherent (i.e. corporate culture, organisational structure and system, skills, language, flow of communication, attitude and behaviour of manager and employee, and transfer of personnel) in technology transfer in the West were applicable in the technology transfer process in Malaysian firms. The study focused on two types of firms, which were electronic-based, i.e. Japanese and American firms. Investigations were also made to elucidate the influence of information technology (IT) on technology transfer.

Data for this study were obtained through personal interviews, structured questionnaire and secondary sources. Results showed that the inherent factors operating in the technology transfer process in Malaysia were in conformity with those found in technology transfer processes occurring in the West. Comparatively, it was found that the Japanese firms underwent more intense changes in their organisational aspect in order to adopt new technologies. The American firms, on the other hand, were found to be agreeable to the notion that IT influenced the technology transfer process. This was because the Americans were more exposed to the usage of IT in the said area as compared to the Japanese.

This study showed that human and organisational aspect of a firm were important in ensuring successful implementation of new technologies in the respective firms. However, further research should be carried out to determine the degree of importance of the inherent factors, which are responsible in ensuring successful technology transfer.

ABSTRAK

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains.

KESAN PEMINDAHAN TEKNOLOGI KE ATAS FIRMA-FIRMA ELEKTRONIK MALAYSIA

Oleh

CHUBASHINI SUNTHARALINGAM

April 1999

Pengerusi : Professor Madya Zainal Abidin Mohamed, Ph.D.

Fakulti : Pusat Pengajian Siswazah Pengurusan Malaysia

Kajian telah dijalankan untuk menentukan impak pemindahan teknologi ke atas firma-firma elektronik di Malaysia dengan menguji sama ada faktor-faktor penting (budaya korporat, struktur dan sistem organisasi, bahasa, komunikasi, sikap dan gelagat pengurus dan pekerja, dan pemindahan pekerja) yang mempengaruhi pemindahan teknologi di negara Barat juga mempengaruhi proses pemindahan teknologi di Malaysia. Kajian in tertumpu kepada dua jenis firma eletronik, yakni firma Jepun dan Amerika. Penyiasatan juga dibuat untuk memahami pengaruh teknologi maklumat ke atas proses pemindahan teknologi.

Data untuk kajian ini diperolehi melalui temuramah, soal selidik berstruktur dan sumber sekunder daripada firma-firma yang dikaji. Keputusan menunjukkan bahawa faktor-faktor penting yang beroperasi dalam proses pemindahan teknologi di negara Malaysia menyerupai faktor-faktor penting yang mempengaruhi proses

pemindahan teknologi di negara Barat. Secara perbandingan, didapati firma-firma Jepun lebih mengalami perubahan terhadap aspek keorganisasian dalam usaha menerapkan teknologi baru. Di samping itu, firma-firma Amerika didapati lebih bersetuju bahawa teknologi maklumat mempengaruhi proses pemindahan teknologi. Ini adalah kerana firma-firma Amerika lebih terdedah kepada penggunaan teknologi maklumat di dalam bidang tersebut.

Kajian ini telah menunjukkan bahawa faktor manusia dan keorganisasian adalah mustahak untuk menjayakan implementasi teknologi baru dalam firma-firma yang dikaji. Penyelidikan selanjutnya harus tertumpu kepada penentuan tahap kepentingan faktor-faktor tersebut dalam menjayakan proses pemindahan teknologi.

CHAPTER I

INTRODUCTION

Malaysia's Manufacturing Sector

In March 1998, Datuk Seri Anwar, the Finance Minister announced that Malaysia registered real GDP growth of 7.8% and enjoyed a trade surplus of RM424 million in 1997 compared with a deficit of RM254 million in 1996. It was the first trade surplus achieved since 1994 and the surplus enabled the current account deficit to be sustained at 5.1% of GNP.

In the manufacturing sector, Malaysia attracted total investments of RM33.441 billion from 854 applicants last year. Of these, RM17.797 billion (59.2%) were from domestic sources (MIDA, 1998). High levels of foreign investments were mainly in petroleum products, electrical and electronic products, basic metal products, fabricated metal products and chemical and chemical products industries and food. These six industries accounted for 82.9% of total proposed foreign investment last year.

The Seventh Malaysia Plan targets high output growth for the manufacturing sector at an average rate of 10.7%, while the sector's share of GDP is forecasted to increase to 37.5% in the year 2000.

The potential benefits which Malaysia can reap from the growth in world trade will depend on its capacity to compete in the global market, hence in view of this, the manufacturing sector of the Malaysian economy has undertaken a strategic shift towards using more capital-intensive production technology, in response to the tight labour market condition and to keep pace with technological advancements.

Significant expansion of production capacity is expected in industries producing electrical and electronic products, chemical and chemical products, non-metallic mineral products and transport equipments.

The Malaysian Electronic Industry

The electrical and electronic industries are internationally linked and as such are essential elements of the Malaysian economy. This is because it's contribution to the economy has been and still is very substantial. It was found that the electrical and electronic products remained the largest export earner, netting receipts of RM11.7 billion, or 51.4% of total export earnings in January 1998. Thus, they are in fact the prime movers of Malaysia's drive towards achieving industrialised nation status.

Cheah (1991) outlined that the electronic industry is divided into three broad categories which comprises:-

a. Electronic components - e.g. semiconductor devices

b. Consumer electronics - e.g. audio/video equipment

c. Industrial electronics - e.g. computers and telecommunications equipment.

The electronic components sub-sector present good potential for development in view of the rapidly growing consumer and industrial electronics sub-sector in the country.

The consumer electronics sub-sector's growth is favourable as the European countries are now turning to Malaysia, being the cheapest source and also a major imports for them for their supply of consumer electronics equipment (MIDA, 1998). This is so because it is no longer competitive to produce this particular components over there. Presently, there are in Malaysia a few local companies manufacturing consumer electronics equipment for export.

The products in the industrial electronic sub-sector are generally more of the high-technology type and it may be relatively more difficult for Malaysians to venture into this field. Nevertheless, Malaysians can enter into this field through the establishment of joint ventures with foreign investors or by way of subcontracting.

A major product that is being encouraged for manufacture is computers and computer peripherals.

The Electronic Industry's Performance

Since the establishment of the first semiconductor plant in Penang in 1972, the export-oriented electronic industry has developed rapidly to become one of Malaysia's major industrial sub-sectors within the manufacturing sector and a significant contributor to the country's economy. From a total of just four companies with 577 employees and a total output value of RM25 million in 1970, the industry has expanded to comprise more than 850 companies in production, employing 343,000 workers in 1997 with a total estimated output values of RM85.6 billion (MIDA, 1998). The electronic industry has in recent years attained a high profile among the principal industries in Malaysia and is now a leading contributor to Malaysia's manufacturing, employment and exports.

The performance of the electronic industry during the period 1991-1997 had been particularly remarkable, registering an output growth of 23.2% per annum. Employment in this sub-sector had also been growing rapidly during the same period at an annual average of 13.4% (Table 1.0).

Table 1.0: Malaysia: Output and Employment in the Electronic Industry (1986 - 1997)

Year	Output RM (bil)	Output Growth (%)	Employment No.	Employment Growth (%)
1986	6.5	-	57,000	-
1987	8.9	36.9	89,000	56.1
1988	12.2	37.1	106,000	19.1
1989	15.9	30.3	123,000	16.0
1990	20.3	27.7	144,000	17.1
1991	26.1	28.6	171,000	18.8
1992	32.2	23.4	204,000	19.3
1993	42.1	30.7	231,000	13.2
1994	56.4	34	278,000	20.3
1995	71	25.9	313,000	12.6
1996	76	7.0	329,100	5.1
1997	85.6	12.6	343,300	4.3
Avg. Annual Growth Rate (1991-1997)	-	23.2	-	13.4

Source : Malaysian Industrial Development and Authority (MIDA) (1998)

The number of electronic projects approved by the Government has also increased steadily over the years (Table 1.1). A total of 1,669 electronic projects with a total proposed investment of RM39.5 billion were approved by the government for the period 1985-1997. As at December 1997, there were more than 900 companies in operation, producing a wide range of electronic products.

Table 1.1: Malaysia: Number of Electronic Projects Approved by Sub-sector, 1985-1997.

Year	Electronic Components		Consumer Electronics		Industrial Electronics		Total	
	No.	Capital Investment (RM mill.)	No.	Capital Investment (RM mill.)	No.	Capital Investment (RM mill.)	No.	Capital Investment (RM mill.)
1985	17	104	9	4.6	11	21.6	37	130.2
1986	19	47.6	11	63.2	8	6.7	38	117.5
1987	29	264	11	145.3	13	159.4	53	568.7
1988	41	582.9	14	322.2	6	134.3	61	1,039.4
1989	64	1,375.7	28	418.9	18	228.5	110	2,023.1
1990	143	2,778.4	25	1,132.1	38	567.3	206	4,477.8
1991	102	1,733	28	87.8	35	466.6	165	2,287.4
1992	93	5,35.5	38	249.8	24	181.3	155	966.6
1993	88	1,559.2	30	107.8	51	413	169	2,080
1994	92	4,606.3	41	138.1	43	472.8	176	5,217.2
1995	95	943.5	29	202.8	50	1,942.3	174	3,088.6
1996	118	11,159.5	28	280.8	46	670.9	192	12,111.2
1997	71	4,755.2	18	52.6	44	582.9	133	5,390.7
Total	**972**	**30,444.8**	**310**	**3,206.0**	**387**	**5,847.6**	**1,669**	**39,,498.4**

Source : MIDA (1998)

Exports of electronic products have been increasing steadily over the years, from RM13.1 billion in 1988 to RM91.7 billion in 1996 and RM107.3 billion in 1997 (Table 1.2). Electronic exports in 1997 comprised RM46.3 billion in electronic components, RM17.8

industrial electronics.