

**HIGH TECHNOLOGY SMALL AND MEDIUM SIZED
ENTERPRISES (HTSMEs): AN ASSESSMENT OF THE
DETERMINANTS OF GROWTH AND
CONSTRAINTS FACED BY
HTSMEs IN MALAYSIA**

by

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ABSTRACT

HIGH TECHNOLOGY SMALL AND MEDIUM SIZED ENTERPRISES (HTSMEs): AN ASSESSMENT OF THE DETERMINANTS OF GROWTH AND CONSTRAINTS FACED BY HTSMEs IN MALAYSIA

The industrial development of Malaysia has moved towards capital-intensive, high technology and high value-added industries. The development of high technology industries is an important element in the country's industrialisation process. High technology small and medium-sized enterprises (HTSMEs) are considered a key feature of growth in the high technology sphere in Malaysia - the creation and development of indigenous HTSMEs is vital.

The primary aim of this research is to examine the growth of HTSMEs and provide policy makers, owner-managers (OMs) and academics with a greater understanding of the factors affecting the growth of such firms in Malaysia. This study also identifies the main constraints faced by HTSMEs and explores ways in which these constraints might be overcome. The programme of research builds upon past studies, but it adds to existing knowledge in an area that is ripe for research.

After a literature review, and the development of an overarching theoretical framework, a number of hypotheses are put forward. The methodological approach combines a questionnaire survey with case studies based on interviews with selected HTSMEs and key informants. The questionnaire is principally concerned with identifying the factors that contribute to growth in HTSMEs, whereas the case studies and interviews concentrate on exploring the constraints identified in the questionnaire survey. The questionnaires were distributed to firms in databases maintained by a number of Government bodies. All the sample firms are considered high technology, as defined by the Promotion of Investment Act 1986. The sample includes firms involved in a variety of activities, from the manufacture of high technology products to the processing of resource-based products. Firms were randomly selected to reflect the size and racial composition of firms in the underlying population of HTSMEs. The questionnaire data were supplemented by 15 in-depth case studies.

Two major findings emerge from this study. First, a number of determinants did have a significant effect on growth of HTSMEs: age of OM; age and size of firm; process innovation and R&D. However, most the hypotheses relating to business strategy were rejected; the researcher offers some explanations for these rejections. Second, the case studies demonstrate that labour constraints among HTSMEs are prevalent, whereas other propositions were not substantiated. In particular, the case studies raise a number of questions about the effectiveness of Government support programmes.

On the basis of the research findings, the researcher is able to put forward a series of recommendations to enhance the growth of HTSMEs in Malaysia.

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ABBREVIATIONS

7MP – Seventh Malaysia Plan
BIC – Business Innovation Centre
DTI – Department of Trade and Industry
FDI – Foreign Direct Investment
FTZ – Free Trade Zone
GDP – Gross Domestic Product
HICOM – Heavy Industries Corporation of Malaysia
HTSME – High Technology Small and Medium-Sized Enterprise
ICA – Industrial Co-ordination Act
IGS – Industry R&D Grant Scheme
IIA – Investment Incentives Act
ILP – Industrial Linkage Programme
IMP1 – First Industrial Master Plan
IMP2 – Second Industrial Master Plan
IT – Information Technology
ITAF – Industrial Technical Assistance Fund
MASTIC – Malaysian Science And Technology Information Centre
MDC – Multimedia Development Corporation
MES – Minimum Efficient Scale
MESDAQ – Malaysian Exchange of Securities and Automated Quotation
MIDA – Malaysian Industrial Development Authority
MIGHT - Malaysian High Technology Government Group
MIMOS – Malaysian Institute of Microelectronics Systems
MITI – Ministry of Trade and Industry
MNC – Multinational Corporation
MOSTE – Ministry of Science, Technology and the Environment
MSC – Multimedia Super Corridor
MTDC – Malaysian Technology Development Corporation
NBD – National Biotechnology Directorate
NEP – New Economic Policy
OECD – Organisation for Economic Co-operation and Development
OM – Owner- Manager
PIA – Promotion of Investment Act
PIO – Pioneer Industries Ordinance
PLC – Private Limited Company
PSEE – Proportion of Engineers and Scientists
PUNB – Perbadanan Usahawan Nasional Berhad
R&D – Research and Development
RBI – Resource-Based Industry
RRDET – Ratio of Research and Development Expenditure to Turnover
SIRIM – Standards and Industrial Research Institute of Malaysia
SME – Small and Medium-Sized Enterprise
SMIDEC – Small and Medium Industries Development Corporation
TFP – Total Factor Productivity
TPM – Technology Park Malaysia
UPM – Universiti Putra Malaysia
UTM – Universiti Teknologi Malaysia
VC – Venture Capital
VCC – Venture Capital Company
VCI – Venture Capital Investor
VDP – Vendor Development Programme

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH

In the past two decades, Malaysia has been transformed from an agriculture-based to a manufacturing-based economy. This transition, which started from the 1970s onwards, has been assisted by a number of industrialisation programmes. These programmes were introduced to promote export-oriented and labour-intensive industries. Subsequently they have led to a rapid inflow of foreign direct investment (FDI) and subsequent growth in the manufacturing sector.

Over the years, the performance of the Malaysian economy, especially in the manufacturing sector, has been impressive. Gross Domestic Product (GDP) growth in 1996 was 8.2 percent, the ninth consecutive year of sustained high growth. Although growth dropped to 4.1 percent in 1997 (the average across the EU was 2.6 percent) and GDP declined by 7 percent in 1998, growth of 10.6 percent was restored by the fourth quarter of 1999.

During the 1990s, Malaysia's industrial development has moved towards capital-intensive, high technology and high value-added industries. The development of high technology industries is an important element in the country's industrialisation process. This development assumes greater importance because the availability of workers, both skilled and unskilled, is becoming a constraint (Low, 1993). With unemployment rate currently at 2.9 percent, technically full employment (Sulong, 1997), Malaysia is no longer attractive as a location for labour-intensive industries (Malaysia, 2000). The emergence of cheaper production bases in the newly emerging market economies, such as Thailand and Indonesia, means that Malaysia has to sustain its competitiveness by shifting towards higher productivity and the production of export-oriented, skill-intensive products and services.

The current strategies to achieve the nation's industrialisation objectives include the Seventh Malaysia Plan (7MP: 1996-2000) and the Industrial Master Plan (IMP: 1986-1995 and IMP2: 1996-2005). The 7MP lays down policies and strategies to sustain the competitiveness of the manufacturing sector, and sets out measures to ensure a smooth transition from labour-intensive manufacturing towards high technology industries. The IMP, formulated in two stages, aims to chart a long-term industrialisation path for the country. The IMP emphasised moving beyond manufacturing operations to include research and development (R&D), the enhancement of industrial linkages, and increased productivity and competitiveness. 7MP and IMP led to the establishment of the Multimedia Super Corridor (MSC) in 1996, a strategy designed to act as a catalyst for information technology development in the region. The MSC project requires enormous financial input, as well as considerable technological and skilled manpower resources.

However, Malaysia's march towards high technology development has been hindered by a number of setbacks. As stated above, the country is experiencing a lack of skilled manpower, and also funding problems (Ford, 1997). Incentives to lure back Malaysian engineers and scientists from overseas have been unsuccessful, and private sector financial institutions perceive high technology ventures as risky. High technology small and medium-sized enterprises (HTSMEs)¹ have been a key feature of growth in high technology development in the UK and the US (Oakey et al., 1988). Much of the growth in the high technology sphere in the US was provided by small firms in the 1970s (Morse, 1976). After concentrating on larger enterprises for many years, Malaysia now needs to focus its efforts on indigenous HTSMEs.

HTSMEs are considered 'special' because they differ not only from conventional small and medium sized enterprises (SMEs), but also from larger high technology enterprises (Storey and Tether, 1998). They differ from 'ordinary' SMEs on the grounds that they are owned and managed by highly educated technical entrepreneurs who tend to lack managerial skills. HTSMEs are also engaged in a constant search for funds to finance R&D, the returns from which are long term and uncertain. HTSMEs have more problems than their larger counterparts in raising the necessary capital (Keogh and Evans, 1998).

While problems and constraints confront all SMEs, they tend to be more severe for HTSMEs (Moore, 1994; Oakey, 1997). HTSMEs have to develop their ideas in uncertain circumstances. Their products or processes are often not market tested and such firms are exposed to technology that becomes obsolete very quickly, requiring substantial R&D and new product innovation (Von Glinow and Mohrman, 1990; Slatter, 1992; Reid and Garnsey, 1996). Nevertheless, the evidence suggests that the risks involved in HTSMEs can be outweighed by their advantages.

This study seeks to provide important insights into the growth of HTSMEs, and to explore how barriers of growth might be overcome. My findings should provide guidance for policy makers, practitioners and academics on how to enhance the growth of HTSMEs.

1.2 RESEARCH RATIONALE

In the past thirty years, much interest has been focused on the identification of factors affecting the growth of conventional SMEs. A number of studies, which examine the determinants of, and constraints on, the growth of SMEs have been conducted (for example: Bosworth and Jacob, 1987; Barber et al., 1989; Advisory Council on Science and Technology (ACOST), 1990; Birley and Westhead, 1990; Aston Business School, 1991; Barkham, 1992; University of Cambridge Small Business Research Centre, 1992; Reynolds, 1993; Storey, 1994b; Barkham et al., 1996b). There is, therefore, a well-documented body of knowledge that should guide policy makers in the effective development and implementation of support programmes to SMEs. However, to date, little empirical work has been conducted to explore the growth determinants and constraints affecting HTSMEs. Many of the studies on the growth of HTSMEs have been conducted by just a few researchers, including Oakey (1984; 1991b; 1993b), Roberts (1991), Slatter (1992) and Westhead et al. (1995).

While an extensive range of official support is available to SMEs or high technology firms in Malaysia, the researcher has the strong impression that the 'special' requirements specific to HTSMEs are not adequately addressed in the framework of the support services available. A study of growth factors should provide

policy makers with a better framework through which different types of HTSMEs could be identified and supported (Tether, 1997). There has been no empirical investigation of HTSMEs in Malaysia, hence my research addresses a gap in existing knowledge.

The growth factors adopted for this study are based on a number of previous studies conducted independently of each other (Storey, 1994b). According to Storey, if all elements in these studies could be simultaneously included within a single study, a more accurate assessment could be made of the relative impact of these elements on growth of HTSMEs. This study focuses on a number of relevant elements contributing to growth, although time constraints did not permit me to conduct an all-encompassing study.

Another central reason for the interest of policy makers in HTSMEs is their capacity to create, both directly and indirectly, greater employment and wealth than SMEs in traditional activities (Oakey, 1981; Markusen et al., 1986; Reid and Garnsey, 1996; Barkham et al., 1996b). Such research has been conducted only in the United States (Storey and Tether, 1998) and, to a certain degree, in the United Kingdom. However, no study on the contribution of HTSMEs towards wealth and employment creation has been conducted in Malaysia.

HTSMEs play a critically important role in ensuring the 'future prosperity of national industrial economies' (Oakey et al., 1988). However, little is known about the way HTSMEs develop and grow, especially the problems and constraints they face. Although there have been a number of studies conducted on the development of conventional SMEs, particularly in Malaysia, unfortunately there have been no attempts made to analyse the problems and constraints of HTSMEs.

1.3 RESEARCH OBJECTIVES

The present study attempts to fill a gap in the literature, especially in developing countries, by explicitly focusing on growth determinants and constraints. The primary aim of this research is to examine the growth of HTSMEs and provide policy makers, owner-managers (OMs) and academics with a greater understanding of how to

facilitate more rapid growth in this sector. More specifically, this research will address the following issues:

- a) To identify the factors affecting the growth of HTSMEs in Malaysia and determine the relationship between these factors and growth.
- b) To determine the main constraints faced by HTSMEs and explore ways in which these constraints could be overcome.

This research builds upon past studies and aims to identify and explore the relationship between growth determinants and constraints for HTSMEs.

This study also explores the contribution of HTSMEs towards employment creation, wealth generation and the enhancement of R&D activity in Malaysia. This information should be able to guide policy makers in formulating policies to facilitate growth in the high tech sector.

1.4 RESEARCH QUESTIONS

The study will attempt to answer the following major question:

How is it possible to facilitate more rapid growth in HTSMEs in Malaysia?

Against the background set out in Section 1.1, and in relation to the objectives formulated in Section 1.3, the study attempts to answer the following questions to address the principal question posed above:

The OM Characteristics

- i) Is there a positive relationship between the level of education of the OM and the growth of HTSMEs?
- ii) Is there a positive relationship between prior managerial experience of the OM and the growth of HTSMEs?
- iii) Is there a positive relationship between the age of the OM and the growth of HTSMEs?
- iv) Is there a positive relationship between the length of the career history of the OM and the growth of HTSMEs?
- v) Is there a positive relationship between the gender of the OM and the growth of HTSMEs?
- vi) Is there a positive relationship between the ethnic background of the OM and the growth of HTSMEs?

The Characteristics of the Firm

- i) Is there a positive relationship between the age of the firm and the growth of HTSMEs?
- ii) Is there a positive relationship between the size of the firm and the growth of HTSMEs?
- iii) Is there a positive relationship between limited company status and the growth of HTSMEs?
- iv) Is there a positive relationship between the location of a business and the growth of HTSMEs?

- v) Is there a positive relationship between business sectors and the growth of HTSMEs?

The Business Strategy

- i) Is there a positive relationship between the level of market research conducted and the growth of HTSMEs?
- ii) Is there a positive relationship between adopting a marketing orientation and the growth of HTSMEs?
- iii) Is there a positive relationship between product innovation and the growth of HTSMEs?
- iv) Is there a positive relationship between process innovation and the growth of HTSMEs?
- v) Is there a positive relationship between accepting external equity and the growth of HTSMEs?
- vi) Is there a positive relationship between receiving government support and the growth of HTSMEs?
- vii) Is there a positive relationship between R&D expenditure and the growth of HTSMEs?

Constraints

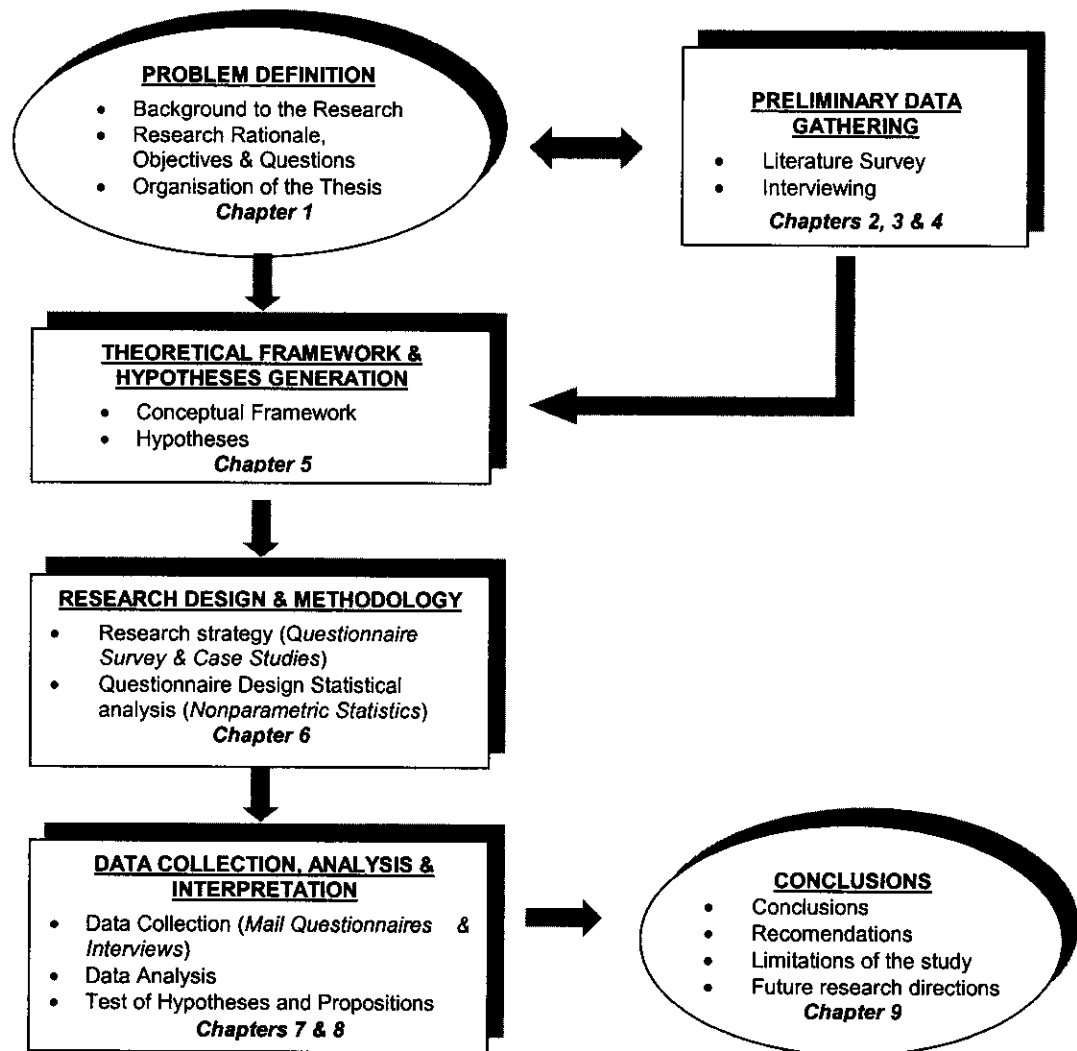
- a) What are the major constraints hindering the growth of HTSMEs?
- b) How do these constraints affect growth?
- c) What steps have been taken by HTSMEs and various Government agencies to overcome these barriers?

A study of the relationships above should assist OMs, policymakers, practitioners and academics in developing existing high value added and capital intensive industries as well as attracting new ones.

1.5 ORGANISATION OF THE THESIS

The content of this thesis is organised into nine chapters. Figure 1-1 shows an overview of the research process and corresponding chapters.

FIGURE 1-1 Overview of the Research Process and Corresponding Chapters



Adapted and modified from Sekaran (1992)

This first chapter gives an overview of the thesis, identifies the research problems and summarises the reasons for undertaking the research.

The following three chapters consist of literature reviews. Chapter Two reviews the development of industrial policy in Malaysia and examines the stages of industrial growth and policies formulated to support the growth of high technology industries and SMEs. A review of recent developments in the Multimedia Supercorridor (MSC), with specific reference to the role of SMEs in this high technology project, is also provided.

Chapter Three reviews the various definitions of a high technology industry, including both conceptual and operational definitions. Embedded in the discussion is the question of why HTSMEs should be the focus of industrial policies in any country. The chapter discusses various definitions of SMEs adopted in a number of developed countries and examines policies supporting HTSMEs in the US, UK and Japan.

The fourth chapter reviews the stages that HTSMEs have to pass through as they grow. The most appropriate measurement of growth adopted for the study is also discussed. A review of factors that influence growth of HTSMEs is also provided. The study adopts the strategic growth model to explain the relationship between determinants and constraints. The study utilises the three basic components of growth proposed by Storey (1994b): the OM; the firm; and, the business strategy. A review of the constraints that hinder the growth of HTSMEs is also provided.

Chapter Five outlines the conceptual framework developed from the literature and discusses the key variables to be studied in the two stages of research – questionnaire survey and case studies. The implied associations between variables to be studied are also discussed. After identifying and defining variables, and establishing the relationships among variables, the research hypotheses are then generated to test the relationships.

Chapter Six outlines the research methods used in collecting the data for analysis. The chapter begins by reviewing the methodologies employed by previous

researchers. The strategies adopted in this study, questionnaires and case studies, are given particular emphasis. The chapter also explains how the major constraints derived from the questionnaire survey are incorporated into the semi-structured interviews on which the case studies are based. Finally, the chapter describes the data analysis techniques used in the study.

Chapter Seven analyses the data gathered in the questionnaire survey. The hypothesis testing is discussed in some depth.

Chapter Eight presents and discusses the qualitative findings from the case studies. The validity of a series of propositions is explored, although any conclusions are only tentative.

Finally, Chapter Nine draws together the conclusions and recommendations from the research project. The key findings and contributions of the study are also presented and discussed. This final chapter also assesses: the implications of the study's findings for both research and practice; the limitations of the research; and potential areas for further research.

Notes

¹ Little (1977) defined HTSMEs as independently owned businesses established for the exploitation of an invention or technological innovation, implying substantial technological risks. Other commonly used terms that have similar definitions to HTSMEs include: new technology-based firms (Little, 1977); technology-based SMEs (Mason et al., 1996); new technology-based small firms (Philpott, 1994); and, high technology small firms (Oakey, 1996).