TECHNOLOGY AND SKILLS IN SINGAPORE

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ASEAN Regional Studies Promotion Programme
General Editors: C.Y. Ng, R. Hirono, Robert Y. Siy, Jr.

EFFECTIVE MECHANISMS FOR THE ENHANCEMENT OF TECHNOLOGY AND SKILLS IN SINGAPORE

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List of Abbreviations

AERTU	ASEA-EDB Robotic Training Unit
ARC	Applied Research Corporation
BEST	Basic Education for Skills Training
CAAS	Civil Aviation Authority of Singapore
CAD/CAM	Computer Aided Design and Manufacture
CAS	Capital Assistance Scheme
CCS	Centre for Computer Studies
CECTU	Computervision-EDB CAD/CAM Training Centre
CIP	Census of Industrial Production
CNC	Computer Numerical Control
CPTE	Council for Professional and Technical Education
DBS	Development Bank of Singapore
DCA	Department of Civil Aviation
DISCS	Department of Information Systems and Computer Science
EDB	Economic Development Board
FSI	French-Singapore Institute of Electro-Technology
GSI	German-Singapore Institute of Production Technology
GSP	Generalised System of Preferences
IBM	International Business Machines
IDSS	Industrial Development Scholarship Scheme
Intech	Initiatives in New Technology
Intraco	International Trading Company
ISS	Institute of Systems Science
ITC	Industrial Technician Certificate
ITGS	Industrial Training Grant Scheme
JECTU	JAPAX Group-EDB CNC Training Unit
JITS	Joint Government Industrial Training Schemes
JSIST	Japan-Singapore Institute of Software Technology
JTC	Jurong Town Corporation
MINDEF	Ministry of Defence
MNCs	Multinational Corporations
MST	Ministry of Science and Technology
MTI	Ministry of Trade and Industry
NCB	National Computer Board
NPB	National Productivity Board

NPC	National Productivity Centre
NTC	National Trade Certificate
NTUC	National Trades Union Congress
NUS	National University of Singapore
NWC	National Wages Council
OTS	Overseas Training Grant Scheme
PDAS	Product Development Assistance Scheme
PSA	Port of Singapore Authority
PSC	Public Service Commission
PWD	Public Works Department
R&D	Research and Development
RDAS	Research and Development Assistance Scheme
RSE	Research Scientists and Engineers
S&T	Science and Technology
SDF	Skills Development Fund
SIFS	Small Industries Finance Scheme
SISIR	Singapore Institute for Standards and Industrial Research
SITAS	Small Industries Technical Assistance Scheme
STC	Singapore Technology Corporation
TAS	Telecommunication Authority of Singapore
TCDC	Technical Cooperation among Developing Countries
UNCSTED	UN Conference on Science and Technology for Development
UNCTAD	United Nations Conference on Trade and Development
VITB	Vocational and Industrial Training Board
WIPO	World Intellectual Property Organization

Foreword

One of the central objectives of the Association of Southeast Asian Nations (ASEAN), as embodied in the Bangkok Declaration under which ASEAN was founded, is the promotion of Southeast Asian studies. In this context, ASEAN warmly welcomed the offer of Mr Zenko Suzuki, the Prime Minister of Japan, in early 1981 to support the launching of an ASEAN Regional Studies Promotion Programme.

After extensive consultations among ASEAN member countries and between ASEAN and Japan, it was agreed that the ASEAN Regional Studies Promotion Programme, initially to extend over a period of five years, should focus on policy-oriented socio-economic research. Given the overriding importance that ASEAN attaches to economic development and the vital role of ASEAN-Japan economic relations in this regard, ASEAN-Japan Industrial Co-operation was adopted as the first topic of research under the Programme. The second topic chosen was Effective Mechanisms for the Enhancement of Technology and Skills in ASEAN. An integrated ASEAN-Japan Overview, together with volumes on the individual ASEAN countries, are the fruits of this second phase of research.

The recent history of ASEAN-Japan relations has been marked by a degree of ambivalence. As the first Asian nation to industrialize successfully and to have risen as a phoenix from the ashes of war-time destruction to the leading heights of industrial and technological power, Japan has always been held with a degree of awe and admiration by its southern ASEAN neighbours. Such awe and admiration have, however, been tinged with a certain amount of suspicion derived from war-time memories, especially as the impact of Japan's post-war economic expansion becomes increasingly felt in the ASEAN region.

On the Japanese side, historical circumstances and the need for economic reconstruction in the early post-war years made it unavoidable that, initially, its external relations were largely oriented towards the West, especially the United States. However, as Japan rose to global economic prominence, and its economic presence in Southeast Asia grew, it increasingly came to attach greater importance to its relationship with the ASEAN countries.

ASEAN first approached Japan collectively in the early 1970s on the question of Japan's production of synthetic rubber and its adverse impact on the ASEAN economies. From such narrow beginnings, the dialogue has quickly expanded into the present broad-based consultative framework of the ASEAN-Japan Forum. Given the historical background, there is a general recognition that while economics must remain the central pillar of ASEAN-Japan relations, the socio-political context under

which such economic relations evolve is also of prime importance. Thus, a central objective of the ASEAN-Japan dialogue is the development of greater mutual awareness, understanding, friendship, and trust between the peoples of ASEAN and Japan, especially among the younger generation. In this regard, it is particularly heartening that the present Programme has begun to bring together many young researchers from both ASEAN and Japan in collaborative research on various important and pressing issues of mutual concern. The interactive thought process involved in such research, and the development of common perceptions on a wide range of issues, cannot but help improve the effectiveness of the dialogue and establish ASEAN–Japan relations on a firm basis. The ASEAN Secretariat and the Japan Institute of International Affairs, as the ASEAN and Japanese co-ordinating units for the Programme respectively, are happy and honoured to be playing a part in this process.

Phan Wannamethee
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ASEAN Secretariat
Jakarta

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March 1986

Preface

The study on "Effective Mechanisms for the Enhancement of Technology and Skills in ASEAN" was undertaken as the second phase of research under the ASEAN Regional Studies Promotion Programme, the first being "ASEAN-Japan Industrial Cooperation".

Country research teams from the five ASEAN countries and Japan were required to identify and examine problems in their respective countries in technology transfer and skills enhancement. Such a study, involving different countries with varied experiences, naturally poses problems of comparability. Nevertheless, to maximize comparability across countries, the study relied on the use of a common core questionnaire as well as a common analytical framework and data analysis procedure. In addition, the incorporation of country-specific factors salient and relevant to technology transfer and skills enhancement was encouraged. The final research design therefore attempts to accommodate such requirements.

Thus, primary data were collected through sample surveys taken on selected industries located in the ASEAN countries. Conclusions were then drawn and recommendations made from the findings of such surveys. From this exercise, five ASEAN-country papers were produced by the respective ASEAN-country research teams. These together with two papers prepared by the Japanese team giving Japanese perceptions and historical experiences on technology transfer and skills enhancement in ASEAN form the basis of an integrated overview which has been published under the title, *Effective Mechanisms for the Enhancement of Technology and Skills in ASEAN: An Overview*. The five country-papers are also being published separately. The monograph that follows is one in the series.

C. Y. Ng,
R. Hirono,
and
Robert Y. Siy, Jr.
General Editors

Introduction

Improvements in technological capability and the enlargement of technical capacity are both a cause and effect, as well as implicit objectives, of industrialization — or indeed of economic development. Given the importance attached to technological upgrading in the countries of the Association of Southeast Asian Nations (ASEAN) and their dependence on imported technology, the policies and issues concerning technology, especially its international aspects, are matters of vital national concern. This study examines the issue of, and framework for, technology and skills development in Singapore as a background to, and basis for, policy recommendations on ASEAN-Japan co-operation. As a small resource-lacking economy whose activities have become very closely intertwined with those of the international economy, the experience of Singapore in this regard would seem to have particular relevance.

Organization of the Study

Chapter 1 recapitulates the policy framework and historical experience of industrialization in Singapore. This is done with a view to highlighting its present phase which stresses on high technology. The conceptual framework, through which technology and its transfer is viewed, is presented in Chapter 2. Chapter 3 focuses on science and technology development in Singapore — more specifically, its present status, development strategy, institutional framework, and related issues. The government plays an ubiquitous role in creating the economic environment for, as well as formulating specific measures to promote, technological development. Its basically *laissez-faire* approach, with minimum controls and regulations on the import of technology, is in contrast to the more nationalistic approaches adopted in other ASEAN and developing countries. What constitutes the ingredients of such a formula which has enabled Singapore to hitch its industrial structure on to higher grids of technology, merits discussion.

Technological capability, as human knowledge applied to material production, is ultimately vested in human beings. Singapore's forte in its industrialization effort has always been its emphasis on the labour ingredient, or human dimension, in the industrialization process. Chapter 4 discusses the major theme of education, manpower planning, and skills training as it bears upon the industrialization process.

To obtain greater insight and depth of understanding on the issues raised, a survey of four selected industries — namely, the machinery industry, excluding

electrical and electronics, the precision equipment industry, the electrical industry, and the electronics industry — was conducted to generate information based on micro-level experiences and case studies. Chapter 5 presents the methodology and results of this survey. From such a survey, much light can be shed on the policies and strategies of foreign suppliers of technology, especially the multinational corporations (MNCs), and their variations, by nationality and cultural affinities or styles, with regard to technology development and transfer. Such experiences may or may not be unique to Singapore but they provide a ground-level glimpse at how MNCs have responded to the government's technological plans and measures — at least in the surveyed industries. The final chapter contains a summary of the findings as well as recommendations for Singapore-Japan and ASEAN-Japan co-operation.