

MALAYSIAN SCIENCE AND TECHNOLOGY INDICATORS

2004 Report



MOSTI

MALAYSIAN SCIENCE AND TECHNOLOGY INDICATORS

2004 Report

Published by:



MASTIC

MALAYSIAN SCIENCE AND TECHNOLOGY INFORMATION CENTRE (MASTIC)
Ministry of Science, Technology and Innovation (MOSTI)

For further enquiries, please contact:

Tel : 603-8885 8038

Fax : 603-8889 2980

Email : mastic@mastic.gov.my

Website : <http://www.mastic.gov.my>

Concept & Design by
Impact Challenger (M) SDN BHD (234100-K)

Copyright ©MASTIC 2004. All Rights Reserved

No part of this publication may be produced in any form either in whole or in part, without written permission from the publisher.

January 2005

Contents

PREFACE

ACKNOWLEDGEMENTS

LIST OF ABBREVIATIONS

MALAYSIA : KEY SOCIO-ECONOMIC INDICATORS, 1998-2002

CHAPTER 1

INTRODUCTION 1

1.1 Organisation of the Report 3

CHAPTER 2

GENERAL OVERVIEW OF MALAYSIA'S ACHIEVEMENTS IN SCIENCE AND TECHNOLOGY 5

2.1 Education in S&T 7

2.2 Human Resource in S&T 7

2.3 Research and Development (R&D) Activities 8

2.4 Innovation 9

2.5 Trade in Technology 10

2.6 Publications and Citations 10

2.7 Public Awareness in S&T 11

2.8 Public Support for S&T 12

2.9 International Comparisons 13

CHAPTER 3

EDUCATION IN SCIENCE AND TECHNOLOGY 15

3.1 Education in S&T at the Secondary School and Pre-University Level 16

3.2 Tertiary Education in S&T 17

3.2.1 Public Educational Institutions 18

3.2.2 Enrolment in First Degree Courses 18

3.2.3 Graduations in First Degree Courses 19

3.2.4 Enrolment in Graduate Degree Courses 22

3.2.5 Graduation in Masters and Doctoral Degree Courses 25

3.3 Tertiary Education in S&T – Private Educational Institutions 25

3.3.1 Enrolment in First Degree Courses 26

3.3.2 Graduations in First Degree Courses 26

3.3.3 Enrolment in Graduate Degree Courses 28

3.3.4 Graduations in Masters and Doctoral Degree Courses 28

3.3.5 Enrolment in Other Programmes 28

3.3.6 Graduation in Other Programmes 30

CHAPTER 4		
HUMAN RESOURCE FOR SCIENCE & TECHNOLOGY		33
4.1	Workforce in Research and Development (R&D)	34
4.1.1	Gender Composition of Research Personnel (Headcount and FTE) by Sector	36
4.1.2	Researchers (Headcount and FTE) by Sector, Qualification and Gender	37
4.1.3	Types of Research by Sector	38
4.1.4	Field of Research (FOR) and Qualification by Sector	39
4.1.5	Socio-Economic Objectives (SEO) and Qualification by Sector	40
4.2	Private Sector R&D Personnel (Headcount and FTE)	42
4.2.1	Private Sector R&D Personnel by Industry, Nationality and Gender	42
4.2.2	Private Sector R&D Researchers (FTE) by Industry, Qualification and Gender	43
4.2.3	Private Sector R&D Personnel (FTE) by Field of Research (FOR)	46
4.3	R&D Personnel (Headcount and FTE) in GRIs by Institution	46
4.3.1	GRI Research Personnel (Headcount) by Nationality and Qualification	46
4.3.2	GRI R&D Personnel (FTE) by Field of Research (FOR)	48
4.4	R&D Personnel (Headcount and FTE) in IHLs by Institution and Nationality	49
4.4.1	IHL Researchers by Nationality, Gender and Qualification	50
4.4.2	IHL R&D Personnel (Headcount and FTE) by Field of Research	51
4.5	Malaysian-Born Scientists and Engineers Working Abroad	53
	The Returnees Programme	57

CHAPTER 5		
RESEARCH AND DEVELOPMENT ACTIVITIES		59
5.1	R&D Expenditure: An Overview	60
5.1.1	R&D Activities by Type, Field of Research and Socio-Economic Objectives (SEO)	61
5.2	Industry R&D Expenditure	62
5.2.1	R&D Expenditure by Sector and Field of Research (FOR)	62
5.2.2	Socio-Economic Objectives of R&D Expenditure by Sector	63
5.2.3	Sources of Funds and Extramural R&D Expenditure	65
5.2.4	R&D Expenditure Outsourced	65
5.3	Private Sector R&D	68
5.3.1	R&D Expenditure by Size	68
5.3.2	R&D Expenditure by Ownership	69
5.3.3	Type of R&D Expenditure	71
5.4	R&D Expenditure in Government Research Institutes (GRIs)	71
5.5	R&D Expenditure in Institutes of Higher Learning (IHLs)	72
5.6	R&D Output	73
5.6.1	Patent Count by Country and Type	79
5.6.2	Inventor Awards	80
CHAPTER 6		
INNOVATION IN THE MALAYSIAN MANUFACTURING SECTOR		81
6.1	Innovation in the Manufacturing Sector	82
6.1.1	Overall Level of Innovation	82
6.1.2	Innovation Across Industries	83
6.2	Innovation and Firm Size	84
6.3	Innovation and Foreign / Local Ownership	86
6.3.1	Innovation and Ownership Structure	87
6.4	Geographic Distribution of Innovating Firms	88
6.5	Age Profile of Innovating Firms	88
6.6	Product and Process Innovations	88
6.7	Objectives for Innovation	89
6.8	Sources of Information for Innovation	90
6.9	R&D Expenditure for Innovation	90
6.10	Impact of Innovation	92
6.11	Factors Hampering Innovation	93
	Innovation Across Time: Logitudinal Evidence from Two National Surveys of Innovation	94

CHAPTER 7		
TRADE IN TECHNOLOGY		95
7.1	Overview of Trade in Technology	96
7.2	Technology Trade in Manufactured Goods	96
	7.2.1 Trade in High-Technology Manufactured Goods	97
	7.2.2 Trade in Medium-High Technology Manufactured Goods	97
7.3	Technology Trade in Services	98
7.4	Destinations of Payment and Sources of Receipt Flows	100
	7.4.1 Royalties	100
	7.4.2 Contracts and Professional Charges	103
	7.4.3 Construction and Engineering	104

CHAPTER 8		
PUBLICATIONS AND CITATIONS		107
8.1	Bibliometric Database and Indicators	109
8.2	National Science Indicators (NSI) Database	110
	8.2.1 An Overview of Publications Output By Country	110
	8.2.2 Publications of Malaysia	112
8.3	National Citation Report – Malaysia	118
	8.3.1 Authors' Contribution and Impact	118
	8.3.2 Scientific Collaboration and Co-operation	119

CHAPTER 9		
AWARENESS, KNOWLEDGE AND ATTITUDE TOWARDS SCIENCE AND TECHNOLOGY		127
9.1	Perceived Knowledge of Science & Technology (S&T) - related and General Issues	128
	9.1.1 Gender Comparison	130
	9.1.2 Age Group Comparison	131
9.2	Stated Interest in S&T - related and General Issues	132
	9.2.1 Gender Comparison	133
	9.2.2 Age Group Comparison	134
9.3	Attitude Towards Science and Technology	134
	9.3.1 Age Group Comparison	136
	9.3.2 Rural Urban Comparison	136
	9.3.3 Educational Level and Attitude Towards S&T	137
	9.3.4 Gender Comparison	139
9.4	Understanding of Scientific Terms and Concepts	140
	9.4.1 Age Group Comparison	141
	9.4.2 Understanding of Scientific Terms and Concepts by Educational Streams	143
	9.4.3 Understanding of Scientific Terms and Concepts by Gender	144
9.5	Sources of Information and Media Habits	145
	9.5.1 Media Habits by Age Group, Locality, Educational Level and Gender	145

CHAPTER 10		
PUBLIC SUPPORT FOR SCIENCE AND TECHNOLOGY		149
10.1	New Schemes Introduced in 2002	150
10.1.1	Technology Acquisition Fund for Women (TAF-W)	150
10.1.2	E-Manufacturing Grant	151
10.1.3	Grant for RosettaNet Standard Implementation for SMEs	152
10.1.4	Grant for Upgrading Engineering Design Capabilities	152
10.2	Applications and Approvals for S&T-related Schemes	152
10.2.1	Technology Acquisition Fund (TAF)	152
10.2.2	Commercialisation of R&D Fund (CRDF)	155
10.2.3	Double Deduction for Income Tax Purposes	156
10.2.4	Industrial Technical Assistance Fund (ITAF 2)	159
10.2.5	Demonstrator Application Grant Scheme (DAGS)	161
10.2.6	Multimedia Super Corridor (MSC) Research and Development Grant Scheme (MGS)	162
10.2.7	Industry R&D Grant Scheme (IGS)	165
10.2.8	Intensification of Research in Priority Areas Program (IRPA)	167
CHAPTER 11		
INTERNATIONAL COMPARISONS		171
11.1	Education	174
11.2	R&D Expenditure	174
11.3	Human Resources and R&D	174
11.4	Innovation	176
11.5	Trade in Technology	177
11.6	Publications and Citations	178
11.7	Public Awareness and Attitude Towards S&T	178
BIBLIOGRAPHY		181
APPENDIX		185
METHODOLOGY		193

