

MALAYSIAN SCIENCE & TECHNOLOGY INDICATORS 2010

Note:

Please note that the findings on Human Resource in R&D (Chapter 3) and R&D for Science and Technology (Chapter 5) in the Malaysian Science & Technology Indicators 2010 report should be referred to the **Updated Results of the National Survey of Research and Development 2008** booklet.

MASTIC, March 2012



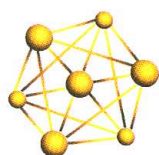
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MALAYSIA



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Malaysian SCIENCE & TECHNOLOGY INDICATORS 2010

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TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

THE RESEARCH TEAM

EXECUTIVE SUMMARY

CHAPTER 1: INTRODUCTION

1.0	PREAMBLE	1-1
1.1	PREPARATION OF THE REPORT	1-2
1.2	ORGANISATION OF THE REPORT	1-4

CHAPTER 2: EDUCATION IN SCIENCE & TECHNOLOGY

2.0	INTRODUCTION	2-1
2.1	EDUCATION IN SCIENCE, MATHEMATICS, AND TECHNOLOGY AT THE SECONDARY AND MATRICULATION LEVEL	2-2
2.1.1	Science, Mathematics and Technical Subjects at the SPM Level	2-2
2.1.2	Science, Mathematics, and Technology Subjects at the STPM Level	2-3
2.1.3	Education in Science and Technology at the Matriculation Level	2-4
2.2	TERTIARY EDUCATION IN SCIENCE AND TECHNOLOGY IN PUBLIC HIGHER EDUCATIONAL INSTITUTIONS	2-5
2.2.1	Enrolment and Graduations in First Degree Courses at Public Higher Educational Institutions by Field of Studies	2-5
2.2.2	Enrolment and Graduation in Master's Degree Courses at Public Higher Educational Institutions	2-6
2.2.3	Enrolment and Graduations in Doctoral Degree Courses	2-6
2.3	TERTIARY EDUCATION AT PRIVATE HIGHER EDUCATIONAL INSTITUTIONS	2-7
2.3.1	Enrolment and Graduations in First Degree Courses at Private Higher Educational Institutions, 2005-2009	2-7
2.3.2	Enrolment and Graduations in Master's Degree Courses, 2005-2009	2-7
2.3.3	Enrolment and Graduations in Doctoral Degree Courses at Private Higher Educational Institutions, 2005-2009	2-8
2.3.4	Enrolment and Graduations in Diploma Level Programmes at Private Higher Educational Institutions, 2005-2009	2-9
2.3.5	Enrolment and Graduations in Certificate Level Programmes at Private Higher Educational Institutions by Field of Study, 2005-2009	2-9
2.4	COMPARISONS BETWEEN GENDER	2-10
2.4.1	Gender Comparison for Enrolment and Graduations in First Degree Courses in Public Educational Institutions from 2008 - 2009	2-10
2.4.2	Gender Comparison for Student's Enrolment and Graduations at the Master's Degree Level in Public Institutions from 2008 - 2009	2-11
2.4.3	Gender Comparison for Student's Enrolment and Graduations at the PhD Level in Public Institutions from 2008 - 2009	2-12
2.5	CONCLUSION	2-13

CHAPTER 3: HUMAN RESOURCE IN RESEARCH AND DEVELOPMENT

3.0	INTRODUCTION	3-1
3.1	HUMAN RESOURCE IN R&D	3-2
3.1.1	Headcount	3-2

3.1.2	Full Time Equivalent (FTE)	3-2
3.1.3	Ratio of Research to Labour Force and Population	3-3
3.1.4	Researcher Qualifications	3-4
3.1.5	Female Participation in R&D	3-5
3.2	HUMAN RESOURCE IN R&D BY SECTOR	3-5
3.2.1	Headcount by Sector	3-5
3.2.2	Private Sector Headcount	3-6
3.2.3	FTE by Sector	3-7
3.2.4	Qualifications of Researchers by Sector	3-7
3.2.5	Women Participation by Sector: Headcount	3-8
3.2.6	Share of Female R&D Personnel Headcount	3-8
3.3	INTERNATIONAL COMPARISON	3-9
3.3.1	FTE of Researchers	3-9
3.3.2	Researchers per Million Population	3-10
3.3.3	Percentage of Women Researchers	3-10
3.4	CONCLUSION	3-11

CHAPTER 4: PUBLIC SECTOR SUPPORT FOR RESEARCH AND DEVELOPMENT IN SCIENCE AND TECHNOLOGY

4.0	INTRODUCTION	4-1
4.1	APPLICATION AND APPROVAL FOR S&T-RELATED GRANT SCHEME	4-2
4.1.1	Technology Acquisition Fund (TAF)	4-3
4.1.2	Commercialisation of R&D Fund (CRDF)	4-5
4.1.3	Demonstrator Application Grant Scheme (DAGS)	4-7
4.1.4	MSC Malaysia Research & Development Grant Scheme (MGS)	4-8
4.1.5	Industrial Technical Assistance Fund (ITAF)	4-10
4.1.6	Biotechnology R&D Grant Scheme	4-13
4.1.7	Support for R&D in Institutions of Higher Learning (IHL)	4-14
	4.1.7.1 ScienceFund	4-14
	4.1.7.2 TechnoFund	4-15
	4.1.7.3 Spectrum Research Collaboration Program (SRCP)	4-17
4.2	DOUBLE DEDUCTION FOR INCOME TAX PURPOSES	4-17
4.3	R&D INVESTMENT INCENTIVES	4-18
4.4	CONCLUSION	4-20

CHAPTER 5: RESEARCH & DEVELOPMENT FOR SCIENCE & TECHNOLOGY

5.0	INTRODUCTION	5-1
5.1	OVERVIEW OF R&D IN MALAYSIA	5-2
5.1.1	R&D Expenditure by the Private and Public Sectors	5-3
5.1.2	Proportion of R&D Expenditure by Sector	5-3
5.1.3	R&D Expenditure by Type of Cost	5-4
5.1.4	R&D Expenditure by Type of Research	5-4
5.1.5	R&D Expenditure by Field of Research (FOR)	5-5
5.1.6	R&D Expenditure by Socio-Economic Objectives (SEO)	5-5
5.1.7	Sources of Funds for R&D Expenditure	5-6
5.2	R&D ACTIVITIES IN THE IHLs	5-6
5.2.1	R&D in the IHLs: Expenditure by Type of Cost	5-6
5.2.2	R&D in the IHLs: Expenditure by Type of Research	5-7
5.2.3	R&D in the IHLs: Expenditure by FOR and SEO	5-7
5.3	R&D ACTIVITIES IN GRIs	5-8
5.3.1	R&D in the GRIs: Expenditure by Type of Cost	5-8

5.3.2	R&D in the GRIs: Expenditure by Type of Research	5-8
5.3.3	R&D in the GRIs: Expenditure by FOR and SEO	5-9
5.4	R&D ACTIVITIES IN THE PRIVATE SECTOR	5-10
5.4.1	R&D in the Private Sector: Expenditure by Type of Cost	5-10
5.4.2	R&D in the Private Sector: Expenditure by Type of Research	5-11
5.4.3	R&D in the Private Sector: Expenditure by FOR and SEO	5-11
5.5	INTERNATIONAL COMPARISON	5-12
5.6	CONCLUSION	5-13
 CHAPTER 6: INNOVATION IN THE PRIVATE SECTOR		
6.0	INTRODUCTION	6-1
6.1	OVERVIEW OF INNOVATION IN THE PRIVATE SECTOR	6-1
6.1.1	Level of Innovation	6-2
6.1.2	Characteristics of the Companies Surveyed	6-3
6.1.3	Objectives of Innovation Activities	6-4
6.1.4	Effects of Innovation	6-5
6.1.5	Factors Hampering Innovation	6-5
6.2	INNOVATION IN THE MANUFACTURING SECTOR	6-6
6.2.1	Type of Innovation carried out in the Manufacturing Sector	6-7
6.2.1.1	Products Innovation	6-7
6.2.1.2	Process Innovation	6-7
6.2.1.3	Marketing Innovation	6-8
6.2.1.4	Organisational Innovation	6-8
6.2.2	Government Support for Innovation	6-9
6.2.3	Intellectual Property	6-10
6.3	INNOVATION IN THE SERVICES SECTOR	6-11
6.3.1	Types of Innovation carried out in the Services Sector	6-11
6.3.1.1	Product Innovation	6-11
6.3.1.2	Process Innovation	6-11
6.3.1.3	Marketing Innovation	6-11
6.3.1.4	Organisational Innovation	6-12
6.3.2	Government Support for Innovation	6-13
6.3.3	Intellectual Property	6-14
6.4	INTERNATIONAL COMPARISON	6-14
6.4.1	The Global Competitiveness Index	6-14
6.4.2	Malaysia's Ranking on Innovation and Competitiveness in the GCI 2010-2011	6-15
6.4.3	The World Competitiveness Yearbook	6-17
6.4.4	Malaysia's Ranking on Innovative Capacity in the WCY 2010	6-18
6.4.5	Malaysia's Ranking on Competitiveness in the WCY 2010	6-18
6.4.6	The Difference in the Rankings	6-20
6.5	CONCLUSION	6-21
 CHAPTER 7: INTELLECTUAL PROPERTY RIGHTS AND BALANCE IN ROYALTIES AND LICENSING FEES		
7.0	INTRODUCTION	7-1
7.1	INTELLECTUAL PROPERTY	7-1
7.1.1	Patents and Utility Innovations	7-2
7.1.2	Trademarks	7-6
7.1.3	Industrial Designs	7-7
7.1.4	Geographical Indications	7-8
7.1.5	Trends in Global Patent Applications and Grants	7-9

7.2	ROYALTIES AND LICENSING FEES	7-12
7.2.1	Trends in Royalties and Licensing Fees	7-13
7.2.2	Globals Royalties and Licensing Fees Receipts and Payments	7-14
7.3	CONCLUSION	7-15

CHAPTER 8: INFORMATION AND COMMUNICATIONS TECHNOLOGY IN MALAYSIA

8.0	INTRODUCTION	8-1
8.1	ICT INFRASTRUCTURE AND ACCESS	8-1
8.1.1	Modes of Internet Access in Malaysia	8-2
8.1.2	Cellular Telephones in Malaysia	8-4
8.1.3	Direct Exchange Lines in Malaysia	8-6
8.2	THE ICT INDUSTRY	8-6
8.2.1	Multimedia Super Corridor (MSC) Malaysia	8-8
8.3	E-COMMERCE	8-9
8.4	ICT FUNDING AND EXPENDITURE	8-11
8.5	WORKFORCE IN ICT	8-13
8.6	INTERNATIONAL COMPARISONS	8-13
8.7	CONCLUSION	8-15

CHAPTER 9: BIOTECHNOLOGY

9.0	INTRODUCTION	9-1
9.1	SECTOR PARTICIPANTS	9-1
9.2	R&D EXPENDITURE BY BIOTECHNOLOGY FIRMS, RIs, AND IHLs	9-3
9.3	FUNDING FOR BIOTECHNOLOGY SECTOR PARTICIPANTS	9-4
9.4	TECHNOLOGY APPLICATION	9-6
9.5	BIOTECHNOLOGY SECTOR REVENUES	9-7
9.6	COLLABORATION IN BIOTECHNOLOGY	9-7
9.7	PATENTS AND RESEARCH OUTPUT	9-8
9.7.1	Biotechnology Patents	9-8
9.7.2	Research Publications in Biotechnology	9-10
9.8	DRIVERS FOR THE BIOTECHNOLOGY SECTOR	9-10
9.9	COMPARISON WITH SELECTED OECD COUNTRIES	9-11
9.10	CONCLUSION	9-14

CHAPTER 10: TRADE IN HIGH-TECHNOLOGY PRODUCTS AND PROFESSIONAL SERVICES

10.0	INTRODUCTION	10-1
10.1	MALAYSIAN HIGH AND MEDIUM HIGH-TECHNOLOGY EXPORTS	10-2
10.2	MALAYSIAN HIGH AND MEDIUM HIGH-TECHNOLOGY IMPORTS	10-4
10.3	MALAYSIAN TRADE BALANCE IN HIGH AND MEDIUM HIGH-TECHNOLOGY INDUSTRIES	10-6
10.4	GLOBAL TRADE IN HIGH-TECHNOLOGY PRODUCTS	10-8
10.5	RECEIPTS AND PAYMENTS FOR PROFESSIONAL SERVICES TRADE	10-14
10.6	CONCLUSION	10-17

CHAPTER 11: BIBLIOMETRICS

11.0	INTRODUCTION	11-1
11.1	ARTICLE OUTPUT BY AUTHORS AFFILIATED WITH INSTITUTIONS IN MALAYSIA	11-2
11.1.1	Overview	11-2
11.1.2	S&T Article Output: Public IHLs	11-3
11.1.3	S&T Article Output: Private IHLs	11-4
11.1.4	S&T Article Output: GRIs	11-5
11.1.5	S&T Article Output: Average Annual Growth (2000-2009)	11-5

11.1.6	S&T Article Output by Broad Subject Field	11-6
11.2	S&T ARTICLE OUTPUT: INTERNATIONAL COLLABORATION	11-8
11.3	S&T ARTICLE OUTPUT: HIGH IMPACT JOURNALS	11-9
11.4	CITATION OF S&T ARTICLES	11-11
11.4.1	Citations by Institutions	11-12
11.5	INTERNATIONAL COMPARISON	11-13
11.6	CONCLUSION	11-16
CHAPTER 12: PUBLIC AWARENESS OF SCIENCE & TECHNOLOGY IN MALAYSIA		12-1
12.0	INTRODUCTION	12-1
12.1	THE PUBLIC'S PERCEIVED INTEREST IN S&T ISSUES	12-1
12.2	THE PUBLIC'S PERCEIVED KNOWLEDGE OF S&T ISSUES	12-3
12.3	PUBLIC ATTITUDES TOWARDS S&T	12-5
12.3.1	Opinions on Job Opportunities in S&T	12-8
12.3.2	Public Attitudes towards Genetic Engineering	12-9
12.4	PUBLIC UNDERSTANDING OF S&T ISSUES	12-10
12.4.1	Theories of Evolution and Big Bang	12-12
12.4.2	Awareness of S&T Concepts	12-13
12.4.3	Subjective Understanding of S&T Concepts	12-14
12.4.4	Objective Understanding of S&T Concepts	12-15
12.5	INFORMATION SOURCES ON S&T, S&T PROGRAMMES, AND S&T RELATED PLACES	12-16
12.5.1	General Sources of Information on S&T	12-16
12.5.2	Awareness of S&T Programmes	12-17
12.5.3	Visits to S&T Related Places	12-18
12.6	INTERNATIONAL COMPARISON	12-20
12.6.1	Perceived Interest in S&T	12-20
12.6.2	Perceived Knowledge of S&T	12-21
12.6.3	Actual Knowledge and Understanding of S&T Issues	12-22
12.6.4	The Malaysian Public's Responses to the Theories of Evolution and Big Bang	12-23
12.6.5	Attitudes towards S&T	12-24
12.6.6	Main Sources of S&T Information	12-26
12.7	CONCLUSION	12-26
CHAPTER 13: RECENT ADVANCEMENTS IN THE ENERGY SECTOR		
13.0	INTRODUCTION	13-1
13.1	THE ENERGY SECTOR IN MALAYSIA – SUPPLY AND UTILISATION	13-1
13.2	ENERGY EFFICIENCY INITIATIVES	13-5
13.3	RENEWABLE ENERGY	13-7
13.4	GREEN TECHNOLOGY INITIATIVES	13-8
13.5	CONCLUSION	13-8
CHAPTER 14: CONCLUSION & THE WAY FORWARD		
14.1	INTRODUCTION	14-1
14.2	MALAYSIA'S S&T PERFORMANCE	14-1
14.3	THE WAY FORWARD	14-3
14.4	CONCLUSION	14-5
LIST OF ACRONYMS AND ABBREVIATIONS		
REFERENCES		
APPENDIX 1		

LIST OF FIGURES

CHAPTER 2: EDUCATION IN SCIENCE & TECHNOLOGY

Figure 2.1	Registration for Science and Mathematics Subjects at the SPM level, 2005 – 2009	2-2
Figure 2.2	Registration for Technical Subjects at the SPM level, 2005 – 2009	2-3
Figure 2.3	Registration for Science and Mathematics Subjects at the STPM level, 2005 – 2009	2-4
Figure 2.4	Registration for Matriculation for Science Subjects, 2000-2009	2-4
Figure 2.5	Percentage of Students Who Passed Matriculation in Science, 2005 - 2009	2-5
Figure 2.6	Students' Enrolment and Graduation in First Degree Courses at Public Higher Educational Institutions by Field of Study, 2008 – 2009	2-5
Figure 2.7	Enrolment and Graduations in Master's Degree Programmes at Public Higher Educational Institutions by Field of Study, 2008-2009	2-6
Figure 2.8	Enrolment and Graduations in Doctoral Degree Programmes at Public Higher Educational Institutions by Field of Study, 2008-2009	2-6
Figure 2.9	Enrolment and Graduations in First Degree Courses at Private Higher Educational Institutions by Field of Study, 2005-2009	2-7
Figure 2.10	Enrolment and Graduations in Master's Degree Courses at Private Higher Educational Institutions, 2005– 2009	2-8
Figure 2.11	Enrolment and Graduations in Doctoral Degree Courses at Private Higher Educational Institutions, 2005 - 2009	2-8
Figure 2.12	Enrolment and Graduations in Diploma Level Programmes at Private Higher Educational Institutions, 2005 – 2009	2-9
Figure 2.13	Enrolment and Graduations in Certificate Level Programmes at Private Higher Educational Institutions by Field of Studies, 2005 - 2009	2-10
Figure 2.14	Gender Comparison for Students' Enrolment in First Degree Level in Public Institutions, 2008 – 2009	2-10
Figure 2.15	Gender Comparison for Students' Graduations in First Degree Level in Public Institutions, 2008 – 2009	2-11
Figure 2.16	Gender Comparison for Students' Enrolment in Master's Degree Level in Public Institutions, 2008 – 2009	2-11
Figure 2.17	Gender Comparison for Students' Graduations in Master's Degree Level in Public Institutions, 2008 – 2009	2-12
Figure 2.18	Gender Comparison for Students' Enrolment in PhD Level in Public Institutions, 2008 – 2009	2-12
Figure 2.19	Gender Comparison for Students' Graduations at the PhD Level in Public Institutions, 2008 – 2009	2-13

CHAPTER 3: HUMAN RESOURCE IN RESEARCH AND DEVELOPMENT

Figure 3.1	Headcount of R&D Personnel, 2000-2008	3-2
Figure 3.2	FTE of R&D Personnel, 2000-2008	3-3
Figure 3.3	Ratio of Researchers to Labour Force and Population, 2000-2008	3-4
Figure 3.4	Headcount of Researcher by Gender and Qualifications	3-4
Figure 3.5	Female Participation in R&D	3-5
Figure 3.6	Headcount by Sector, 2008	3-6
Figure 3.7	Private Sector Headcount, 2000-2008	3-6
Figure 3.8	FTE by Sector and R&D Personnel, 2008	3-7
Figure 3.9	Qualifications of Researchers by Sector	3-8
Figure 3.10	Women Participation by Sector: Headcount	3-8
Figure 3.11	Share of Female R&D Personnel Headcount	3-9

CHAPTER 4: PUBLIC SECTOR SUPPORT FOR RESEARCH AND DEVELOPMENT IN SCIENCE & TECHNOLOGY

Figure 4.1	The Spectrum of Public Funding of Research, Development, and Commercialisation	4-2
Figure 4.2	Number of Projects that Applied for the Technology Acquisition Fund (TAF) by the Industrial Sector, 2007-2009	4-3
Figure 4.3	Number of Projects Approved for the Technology Acquisition Fund (TAF) by the Industrial sector, 2007-2009	4-4
Figure 4.4	Number of Projects that Applied for Funds from the Commercialisation of R&D Fund (CRDF), 2007-2009	4-6
Figure 4.5	Number of Projects Granted for Commercialisation of R&D Fund (CRDF), 2007-2009	4-6
Figure 4.6	Amount Approved for DAGS Applications, 2008-2009	4-8
Figure 4.7	Number of MGS Projects under the Ninth Malaysia Plan (2006-2010) by the MRDCS	4-9
Figure 4.8	Number of Projects and Amount Approved under Matching Grant for Product and Process Improvement (ITAF 2), 2007-2009	4-10
Figure 4.9	Number of Projects and Amount Approved under Matching Grant for Certification and Quality Management System (ITAF 3), 2007-2009	4-10
Figure 4.10	Cumulative Approvals under the Matching Grant for Product and Process Improvement (ITAF 2) and Matching Grant for Certification and Quality Management System (ITAF 3) by Sector, 2007-2009	4-11
Figure 4.11	Cumulative Amount Approved under the Matching Grant for Product and Process Improvement (ITAF 2) and Matching Grant for Certification and Quality Management System (ITAF 3) by Sector, 2007-2009	4-12
Figure 4.12	Project and Grant Approvals under the Biotechnology R&D Grant Scheme by Type of Initiatives, 2008-2009	4-13
Figure 4.13	Number of Projects Applied for and Projects Approved for ScienceFund by Sectors, 2008-2009	4-14
Figure 4.14	Amount Applied for and Amount Approved for ScienceFund by Sectors, 2008-2009	4-15
Figure 4.15	Number of Projects Applied for and Projects Approved for TechnoFund by Sector, 2008-2009	4-16
Figure 4.16	Amount Applied for and Amount Approved for TechnoFund by Sectors, 2008-2009	4-16
Figure 4.17	Number of Projects and Companies that Claimed for R&D Expenditure, 2004-2008	4-17
Figure 4.18	Leading Recipients of Double Deduction for R&D Expenditure by Industrial Sector, 2007-2008	4-19
Figure 4.19	Number of R&D Projects by Type of Incentives, 2005-2009	4-20

CHAPTER 5: RESEARCH AND DEVELOPMENT (R&D) FOR SCIENCE AND TECHNOLOGY

Figure 5.1	Malaysia's GERD and GERD/GDP Ratio, 2000-2008	5-2
Figure 5.2	R&D Expenditure by Sector	5-3
Figure 5.3	Proportion of R&D Expenditure by Sector	5-3
Figure 5.4	R&D Expenditure by Type of Cost	5-4
Figure 5.5	R&D Expenditure by Type of Research	5-5
Figure 5.6	Sources of Funds	5-6
Figure 5.7	IHL R&D Expenditure by Type of Costs	5-7
Figure 5.8	IHL R&D Expenditure by Type of Research	5-7
Figure 5.9	R&D in the IHLs: Expenditure by FOR	5-8

Figure 5.10	R&D in the IHLs: Expenditure by SEO	5-8
Figure 5.11	GRI R&D Expenditure by Type of Cost	5-8
Figure 5.12	GRI R&D Expenditure by Type of Research	5-9
Figure 5.13	R&D in GRIs: Expenditure by FOR	5-9
Figure 5.14	R&D in the GRIs: Expenditure by SEO	5-10
Figure 5.15	R&D in the Private Sector: Expenditure by Type of Cost, 2008	5-10
Figure 5.16	R&D in the Private Sector: Expenditure by Type of Research	5-11
Figure 5.17	R&D in the Private Sector: Expenditure by FOR, 2008	5-11
Figure 5.18	R&D in the Private Sector: Expenditure by SEO	5-11

CHAPTER 6: INNOVATION IN THE PRIVATE SECTOR

Figure 6.1	Percentage of Innovative Companies	6-2
Figure 6.2	Innovation in the Manufacturing and Services Sector	6-2
Figure 6.3	Number of Innovations, 2005-2008	6-2
Figure 6.4	Innovating Companies	6-3
Figure 6.5	Expenditure on Innovation Activities	6-3
Figure 6.6	Local and Foreign Ownership Companies	6-3
Figure 6.7	Innovative and Non-Innovative Companies According to Firm Size	6-3
Figure 6.8	Innovating Firms by Turnover, 2008	6-4
Figure 6.9	Motives for Innovation	6-4
Figure 6.10	Effects of Innovation	6-5
Figure 6.11	Factors Hampering Innovation, 2008	6-6
Figure 6.12	Percentage of Innovating Firms in the Manufacturing Sector (Time Series)	6-7
Figure 6.13	Product Innovation in the Manufacturing Sector, 2005-2008	6-8
Figure 6.14	Process Innovation in the Manufacturing Sector, 2005-2008	6-8
Figure 6.15	Marketing Innovation in the Manufacturing Sector	6-9
Figure 6.16	Organisational Innovation in the Manufacturing Sector	6-9
Figure 6.17	Types of Government Support for Innovation, Manufacturing Sector	6-9
Figure 6.18	Usefulness of Government Support and Assistance, Manufacturing Sector	6-10
Figure 6.19	Intellectual Property Applied for and Granted in the Manufacturing Sector	6-10
Figure 6.20	Product Innovation in the Services Sector, 2005-2008	6-12
Figure 6.21	Process Innovation in the Services Sector, 2005-2008	6-12
Figure 6.22	Marketing Innovation in the Services Sector	6-12
Figure 6.23	Organisational Innovation in the Services Sector	6-12
Figure 6.24	Types of Government Support for Innovation	6-13
Figure 6.25	Usefulness of Government Support Assistance	6-13
Figure 6.26	Intellectual Property Applied for and Granted in the Services Sector, 2005-2008	6-14

CHAPTER 7: INTELLECTUAL PROPERTY RIGHTS AND BALANCE IN ROYALTIES AND LICENSING FEES

Figure 7.1	Patent Applications by Ownership, 1986-2009	7-2
Figure 7.2	Patent Applications by Locals, Universities and Research Institutes, 2009	7-3
Figure 7.3	Malaysia - Patent Grants by Ownership, 1988-2009	7-4
Figure 7.4	Total Patents and Utility Innovations Applied for and Granted, 1988-2009	7-5
Figure 7.5	Patents Granted According Field of Technology, 2008 and 2009	7-6
Figure 7.6	Application of Trademarks According to Nationality, 2007-2009	7-7
Figure 7.7	Registration of Trademarks According to Nationality, 2007-2009	7-7
Figure 7.8	Total Patent Applications in Top Five Countries, 1995-2008 ('000)	7-9
Figure 7.9	Total Patent Grants in Top Five Countries, 1995-2008 ('000)	7-10
Figure 7.10	Total Patent Applications and Grants in Selected Middle Income Countries, 2008	7-10

Figure 7.11	Patent Applications and Grants by Residents in Selected Developed Countries, 2008 (share of total %)	7-11
Figure 7.12	Patent Applications and Grants by Residents in Selected Middle Income Countries, 2008 (share of total %)	7-11
Figure 7.13	Patent applications by major field of technology in five top countries: 2003-2007	7-12
Figure 7.14	Royalties and Licensing Fees Receipts, Payments, and Balance, 2001-2009	7-13
Figure 7.15	Malaysia Royalty Receipts and Payments by Country, 2008-2009	7-14
Figure 7.16	Global Receipts, Payments, and Balance of Trade in Intellectual Property, 1995-2009 (US\$ Billion)	7-14
Figure 7.17	Trade Balance in Intellectual Property by Top Five Countries, 1995-2009	7-15

CHAPTER 8: INFORMATION AND COMMUNICATIONS TECHNOLOGY IN MALAYSIA

Figure 8.1	Penetration Rates for DEL, Cellular Telephones and Broadband in Malaysia, 2005 – 2009	8-2
Figure 8.2	Modes of Internet Access in Malaysia, 2006 – 2009	8-2
Figure 8.3	Broadband Subscriptions: Household and Non-Household, 2006-2009	8-3
Figure 8.4	Broadband Penetration Rates per 100 Households by States in Malaysia, 2009	8-3
Figure 8.5	Number of Hotspot Locations in Malaysia, 2005 – 2009	8-4
Figure 8.6	Cellular Telephone Subscriptions and Penetration Rates in Malaysia, 2006 – 2009	8-4
Figure 8.7	Cellular Telephones and 3G Subscriptions in Malaysia, 2006 – 2009	8-5
Figure 8.8	SMS Usage in Malaysia, 2006 – 2009	8-5
Figure 8.9	DEL Penetration Rates in Malaysia, 2006 – 2009	8-6
Figure 8.10	Projections for Household Broadband Penetration Rates in Malaysia, 2002 – 2015	8-7
Figure 8.11	Investment in the ICT Industry by Type, 2000 – 2009	8-7
Figure 8.12	MSC Malaysia Companies' Contributions to GDP	8-8
Figure 8.13	MSC Malaysia Companies: Number of Companies and Revenue	8-8
Figure 8.14	MSC Status Companies: Job Creation	8-9
Figure 8.15	Total e-Commerce Spending in Malaysia: 2005 – 2013	8-10
Figure 8.16	Total e-Commerce Spending by type in Malaysia in 2006	8-10
Figure 8.17	Internet and Mobile Banking Penetration Rates in Malaysia: 2005 – 2009	8-11
Figure 8.18	ICT Spending in Malaysia, 2008 - 2012	8-11
Figure 8.19	ICT Employee Strength by Skill Categories in Malaysia, 2008 - 2012	8-13
Figure 8.20	Penetration Rates for Broadband, Cellular Telephones, and DEL between Malaysia and Selected Countries: 2008	8-14
Figure 8.21	Top 10 Countries in Internet Usage in Asia: 2009	8-14

CHAPTER 9: BIOTECHNOLOGY

Figure 9.1	Total Numbers of Biotechnology Firms, RIs and IHLs in Biotechnology	9-2
Figure 9.2	Total Numbers of Dedicated Biotechnology Firms and Dedicated Biotechnology R&D Firms	
Figure 9.3	Number of Participants in each Sector for Biotechnology Firms, RIs and IHLs, 2009	9-2
Figure 9.4	R&D Expenditure by Sector Participants, 2008-2009	9-3
Figure 9.5	R&D Expenditure by Biotechnology Firms, RIs and IHLs, 2008-2009	9-3
Figure 9.6	R&D Expenditure by Dedicated Biotechnology Firms and Dedicated Biotechnology R&D Firms, 2008-2009	9-4
Figure 9.7	Share of Funding by Source for Firms, RIs and IHLs, 2008-2009	9-5
Figure 9.8	Value of Funding by Source for Firms, RIs and IHLs, 2008-2009	9-5
Figure 9.9	Share of Funding Sourced Domestically and Internationally by Biotechnology Firms,	

Figure 9.10	Percentage of Firms Developing Products for Customers by Area, 2009	9-6
Figure 9.11	Percentage of Dedicated Biotechnology Firms Developing Products for Customers by Area, 2009	9-6
Figure 9.12	Share of Revenues Generated by Firms through Biotechnology Activities, 2008-2009	9-7
Figure 9.13	Revenues of Biotechnology Firms, Dedicated Biotechnology Firms and Dedicated Biotechnology R&D Firms, 2008-2009	9-7
Figure 9.14	Number of Projects Developed with Collaborators by Biotechnology Firms, RIs and IHLs, 2008-2009	9-8
Figure 9.15	Number of Innovative Products and Processes Developed by RIs and IHLs, 2008-2009	9-8
Figure 9.16	Patent Applications and Patents Granted, 2006-2008	9-9
Figure 9.17	Sources of Patents for Firms, 2008-2009	9-9
Figure 9.18	Sources of Patents Acquired by Firms, 2008-2009	9-9
Figure 9.19	Number of Papers Published Related to Biotechnology by Firms, RIs and IHLs	9-10
Figure 9.20	Reason Provided by Respondents for Venturing into the Biotechnology Sector in Malaysia	9-10
Figure 9.21	Key Drivers for the Malaysian Biotechnology Sector	9-11
Figure 9.22	Restraints in the Malaysian Biotechnology Sector	9-11
Figure 9.23	Number of Biotechnology Firms in Malaysia and Selected OECD Countries	9-12
Figure 9.24	Total Biotechnology R&D Expenditure in Malaysia and Selected OECD Countries	9-12
Figure 9.25	Total Biotechnology R&D Expenditure by Firms in Malaysia and Selected OECD Countries	9-13
Figure 9.26	Total Biotechnology R&D Expenditure by RIs and IHLs in Malaysia and Selected OECD Countries, 2009	9-13
Figure 9.27	Percent of Total Biotechnology Expenditure by Sector Participants in Malaysia and Selected OECD Countries, 2009	9-13
CHAPTER 10: TRADE IN HIGH-TECHNOLOGY PRODUCTS AND PROFESSIONAL SERVICES		10-1
Figure 10.1	Malaysian Composition of Manufacturing Exports by Technology Intensity, 2009	10-2
Figure 10.2	Malaysia High-Technology Manufacturing Exports, 2007-2009	10-3
Figure 10.3	Malaysia Medium High-Technology Manufacturing Exports, 2007-2009	10-4
Figure 10.4	High-Technology Import Share by Technology Areas, 2009	10-5
Figure 10.5	Medium High-Technology Import Share by Technology Areas, 2009	10-6
Figure 10.6	Malaysian Trade Balance in High and Medium High-Technology Products, 2007-2009	10-7
Figure 10.7	Malaysian Trade Balance in High-Technology Products by Technology Areas, 2007-2009	10-7
Figure 10.8	Malaysian Trade Balance in Medium High-Technology Products by Technology Areas	10-8
Figure 10.9	Global Exports of High-Technology Products (1995-2008), US\$ Million	10-9
Figure 10.10	Malaysian Exports of High Technology Products, 1995-2008 (US\$ Million)	10-9
Figure 10.11	Distribution of global exports of high-technology products by area of technology, 2008 (% share of total high-technology products)	10-10
Figure 10.12	Global Export Market Share in Communications and Semiconductors Products for Selected Countries	10-11
Figure 10.13	Global Export Market Share in Computers and Office Machinery Products for Selected Countries	10-11
Figure 10.14	Global Export Market Share in Scientific Instruments and Measuring Equipment Products for Selected Countries	10-12
Figure 10.15	Global Export Market Share in Pharmaceutical Products for Selected Countries	10-12

Figure 10.16	Global Export Market Share in Aerospace Products for Selected Countries, 1995 and 2008	10-12
Figure 10.17	Global Trade Balance in High-Technology Products for Selected Countries, 1995-2008	10-13
Figure 10.18	Global Trade Balance for High-Technology Products, 2008 (US\$ Million)	10-14
Figure 10.19	Malaysian Receipts and Payment for Contract and Professional Charges, 2001-2009	10-14
Figure 10.20	Malaysian Receipts and Payments for Construction and Engineering, 2001-2009	10-16

CHAPTER 11: BIBLIOMETRICS

11-1

Figure 11.1	S&T and Social Sciences Articles (2000-2009)	11-2
Figure 11.2	S&T Article Output: Research Universities (2000-2009)	11-4
Figure 11.3	Share of S&T Article Output by Subject Field (2000-2009)	11-6
Figure 11.4	Institutions by Top Three Fields of Research	11-8
Figure 11.5	S&T Article Output: Collaboration with Foreign Countries (2000-2009)	11-9
Figure 11.6	Citation of S&T Articles (2000-2009)	11-11
Figure 11.7	Average Citation per Article	11-11
Figure 11.8	S&T Article Output: ASEAN-5 (2000-2009)	11-14

CHAPTER 12: PUBLIC AWARENESS OF SCIENCE & TECHNOLOGY IN MALAYSIA

12-1

Figure 12.1	The Public's Perceived Interest in S&T Issues (1998-2008)	12-2
Figure 12.2	The Public's Perceived Interest in S&T Issues 2008	12-3
Figure 12.3	The Public's Perceived Knowledge of S & T Issues (1998-2008)	12-4
Figure 12.4	The Public's Perceived Knowledge of S&T Issues 2008	12-5
Figure 12.5	Public Opinions on the Effects of S&T (1998-2008)	12-6
Figure 12.6	Public Attitudes towards S&T on General Issues (1998-2008)	12-6
Figure 12.7	Public Attitudes towards S&T on Selected Issues (1998-2008)	12-7
Figure 12.8	Public Attitudes towards the Use of Animals in Research 2008	12-8
Figure 12.9	Public Attitudes towards S&T and Religion	12-8
Figure 12.10	Public Opinions on Job Opportunities in S&T (2002-2008)	12-9
Figure 12.11	Percentage of the Malaysian Public Who Have Heard of Genetic Engineering (1998-2008)	12-9
Figure 12.12	Public Attitudes towards the Implementation of Genetic Engineering or Cloning (2004-2008)	12-9
Figure 12.13	Reasons for Disagreement with Genetic Engineering 2008	12-10
Figure 12.14	Reasons for Agreement with Genetic Engineering 2008	12-10
Figure 12.15	Public Understanding of S&T Issues (1998-2008)	12-11
Figure 12.16	Public's Understanding on Theory of Evolution and Big Bang Theory (2002 – 2008)	12-13
Figure 12.17	The Public's Awareness of S&T Concepts 2008	12-14
Figure 12.18	Public's Subjective Understanding of S&T Concepts 2008	12-14
Figure 12.19	Public's Understanding of S&T Concepts 2008	12-15
Figure 12.20	Public Sources of Information on S&T (1998-2008)	12-16
Figure 12.21	Level of Trust in the Media 2008	12-17
Figure 12.22	Public Awareness on S&T Programmes 2008	12-18
Figure 12.23	Visit to S&T Related Places (1998-2008)	12-19
Figure 12.24	Visits to Related Places by Zones 2008	12-19
Figure 12.25	International Comparison of Public Agreement with the Idea "Human Beings as We Know Them Today Developed from Earlier Species of Animals"	12-24

CHAPTER 13: RECENT ADVANCEMENTS IN THE ENERGY SECTOR	13-1
Figure 13.1 Primary Energy Supply and Final Energy Demand in Malaysia, 2003-2007	13-2
Figure 13.2 Final Demand of Commercial Energy by Type of Fuels, 2003-2008	13-2
Figure 13.3 Final Energy Used by Sectors, 2003-2007	13-3
Figure 13.4 Energy Intensity Ratio in Malaysia, 2003-2007	13-3
Figure 13.5 Power Generation Capacity and Maximum Demand in Malaysia, 2007-2009	13-4
Figure 13.6 Electricity Generation Mix in Malaysia, 2009	13-4
Figure 13.7 Electricity Generation by Major Power Producers in Malaysia, 2009	13-4
Figure 13.8 Electricity Intensity Ratio in Malaysia, 2000-2009	13-5
Figure 13.9 Renewable Energy in Malaysia, 2009 & 2015	13-7

LIST OF TABLES

CHAPTER 1: INTRODUCTION

Table 1.1	Principal references Employed in Preparation of Malaysia Science and Technology Indicators Report 2010	1-2
-----------	--	-----

CHAPTER 2: EDUCATION IN SCIENCE & TECHNOLOGY

Table 2.1	Total Registration for Science at the STPM Level	
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CHAPTER 3: HUMAN RESOURCES IN RESEARCH AND DEVELOPMENT

Table 3.1	Headcount by Sector, 2006 and 2008	3-6
Table 3.2	FTE by Sector, 2006 and 2008	3-7
Table 3.3	FTE of Researchers	3-9
Table 3.4	Researchers per Million Population	3-10
Table 3.5	Percentage of Women Researchers	3-11

CHAPTER 4: PUBLIC SECTOR SUPPORT FOR RESEARCH AND DEVELOPMENT IN SCIENCE AND TECHNOLOGY

Table 4.1	Number of TAF Approved Projects and Approved Grant Amount under the Ninth Malaysia Plan, 2006-2010	4-4
Table 4.2	Types of CRDF Grants and Quantum of Funding	4-5
Table 4.3	Number of CRDF Approved Projects and Approved Grant Amount under the Ninth Malaysia Plan, 2006-2010	4-7
Table 4.4	Number of Project Applications and Approvals for DAGS, 2008-2009	4-8
Table 4.5	Number of Projects and Amount Approved for MSC Malaysia Research and Development Grant Scheme (MGS), under the Ninth Malaysia Plan, 2006-2010	4-8
Table 4.6	Types of ITAF Grants and Quantum of Funding	4-10
Table 4.7	Types of Biotechnology R&D Grants Scheme	4-13
Table 4.8	Number of Projects Approved and the Estimated Amount of Deduction for R&D, 2004-2008	4-18

CHAPTER 5: RESEARCH AND DEVELOPMENT (R&D) FOR SCIENCE AND TECHNOLOGY

Table 5.1	GERD by Main Field of Research for 2008 and 2006	5-5
Table 5.2	GERD by Social-Economic Objectives for 2008 and 2006	5-6
Table 5.3	GERD/GDP Ratio (%)	5-12

CHAPTER 6: INNOVATION IN THE PRIVATE SECTOR

Table 6.1	Ranking of Selected Countries According to the GCI 2010-2011 and the GCI 2009-2010	6-16
Table 6.2	The GCI 2010-2011 Rankings for Asia-Pacific Countries	6-17
Table 6.3	The GCI 2010-2011 Rankings for ASEAN Countries	6-17
Table 6.4	Malaysia's Ranking on Innovative Capacity in the WCY 2010	6-18
Table 6.5	The WCY Scoreboard 2010 Overall Ranking	6-19
Table 6.6	Malaysia's Competitiveness Ranking on the WCY, 2006-2010	6-19
Table 6.7	The World Competitiveness Scoreboard 2010 (12 Selected Asia-Pacific Countries)	6-20
Table 6.8	The World Competitiveness Scoreboard 2010 (ASEAN)	6-20

CHAPTER 7: INTELLECTUAL PROPERTY RIGHTS AND BALANCE IN ROYALTIES AND LICENSING FEES

Table 7.1	Patent and Utility Innovations Filed, 2007- 2009	7-2
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Table 7.2	Local Patent Applications by Type of Applicants, 2000-2009	7-3
Table 7.3	Patent and Utility Innovations Granted, 2008 and 2009	7-4
Table 7.4	Top Ten Countries for Patent and Utility Innovation Applications and Granted, 2009	7-5
Table 7.5	Application and Registration of Trademarks, 2008 and 2009	7-6
Table 7.6	Top Ten Countries for Trademark Applications and Registrations, 2009	7-7
Table 7.7	Application of Industrial Designs, 1999-2009	7-8
Table 7.8	Registrations of Industrial Designs, 1999-2009	7-8
Table 7.9	Geographical Indications in Malaysia, 2009	7-9

CHAPTER 8: INFORMATION AND COMMUNICATIONS TECHNOLOGY IN MALAYSIA

Table 8.1	Types of Government Grants Applicable for the ICT Sector	8-12
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CHAPTER 9: BIOTECHNOLOGY

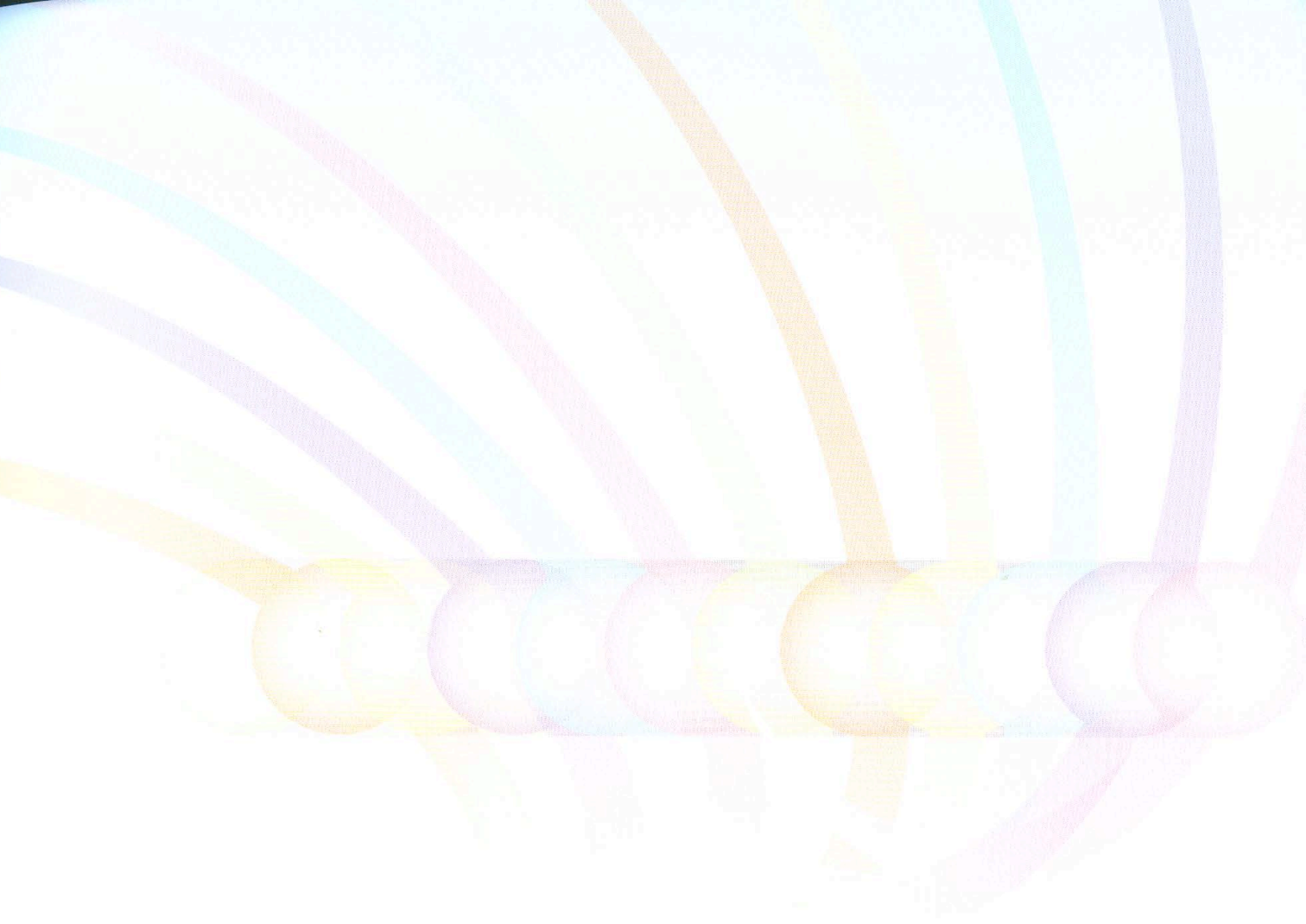
Table 9.1	Total average R&D Expenditure per Biotechnology Firm, 2008-2009	9-3
Table 9.2	Total and Average R&D Expenditure by Dedicated Biotechnology Firms, 2008-2009	9-4
Table 9.3	Total and Average R&D Expenditure by Dedicated Biotechnology R&D Firms, 2008-2009	9-4

CHAPTER 10: TRADE IN HIGH-TECHNOLOGY PRODUCTS AND PROFESSIONAL SERVICES

Table 10.1	High-Technology Manufacturing Exports by Industrial Sub-Sectors, 2007-2009	10-3
Table 10.2	Medium High-Technology Manufacturing Exports by Industrial Sub-Sectors, 2007-2009	10-4
Table 10.3	Malaysian High-Technology Import by Areas of Technologies, 2007-2009	10-5
Table 10.4	Malaysian Medium High-Technology Import by Areas of Technologies, 2007-2009	10-6
Table 10.5	Global Exports of High-Technology Products, Selected Years (1995-2008), US\$ Million	10-8
Table 10.6	Ranking of Future High-Technology Export Potential for Smaller Developing Countries	10-10
Table 10.7	Malaysian Receipts and Payment for Contract and Professional Charges by Country, 2008 – 2009 (RM Million)	10-15
Table 10.8	Malaysian Receipts and Payment for Construction and Engineering by Country, 2008 and 2009 (RM Million)	10-16

CHAPTER 11: BIBLIOMETRICS

Table 11.1	Average Annual Growth of S&T and Social Sciences Articles (2000-2009)	11-3
Table 11.2	S&T Article Output: Public IHLs (2000-2009)	11-4
Table 11.3	S&T Article Output: Private IHLs (2000-2009)	11-5
Table 11.4	S&T Article Output: GRIs (2000-2009)	11-5
Table 11.5	S&T Article Output: Average Annual Growth (2000-2009)	11-6
Table 11.6	Share of S&T Article Output by Subject Field (2000-2009)	11-7
Table 11.7	Growth in Collaborative Work (2000-2009)	11-9
Table 11.8	Number of S&T Articles in Top Five Journals by Subject Field	11-10
Table 11.9	S&T Article Output: Citation by Selected Fields	11-12
Table 11.10	Number of Citations by Institutions (2000-2009)	11-12
Table 11.11	S&T Article Output, Share of World Total, and Growth Rate (2000-2009)	11-13
Table 11.12	Shares (%) of ASEAN's S&T Article Output	11-14
Table 11.13	Growth Rate of S&T Articles Published by ASEAN Countries (2000-2009)	11-15



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- EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This section presents the highlights of the various chapters in the Malaysian Science and Technology Indicators 2010 Report.

Education in S&T

- From 2005 to 2009, Additional Mathematics recorded the number of highest registrations compared to the other subjects in the Science stream at the SPM level. Throughout the same period, there was an overall decrease in the number of students registered for all the science courses at the STPM level. At the matriculation level, more than 90.0% of the students enrolled in the programme passed in science in 2009.
- There is an overall increase in students' enrolment and graduations in S&T at the undergraduate and postgraduate levels in public institutions. In general, students' enrolment in S&T at the undergraduate and postgraduate levels in public institutions is also higher than private institutions.
- At the undergraduate level, females outnumber males in all fields of study in 2008 and 2009 with the exception of the Technical field. However, males outnumber females in enrolment in PhD programmes.

Human Resource in S&T

- The human resource involved in R&D has shown an increasing trend for the period 2000-2008. The total headcount for R&D personnel increased from 23,262 in 2000 to 29,945 in 2008, while the FTE of R&D personnel increased from 10,059.7 in 2000 to 15,221.7 in 2008.
- The decomposition of human resource by sector shows a significant difference between the private and public sectors in 2006 and 2008. The headcount of private sector R&D personnel dropped by 68.0%, from 7,025 in 2006 to 2,249 in 2008, while the FTE for the private sector decreased from 5,627.8 to 2,003.9. The FTE for the IHLs, on the other hand, increased by 87.7%, from 5,438.0 to 10,208.8.
- The participation of women in R&D has also increased, from 9,127 in 2006 to 12,011 in 2008.

Public Sector Support for R&D

- The government has provided numerous grants and incentives for research and development in science and technology. The positive response observed from the public as well as the private research institutions or companies reflects their awareness of the existence of these programmes and their keen interest in being involved in R&D activities.
- However, the demand has, most of the time, exceeded the supply of such grants, given the fact that the number of applications have been, most of the time, found to be much higher than the allocations could allow.

Research and Development

- Throughout the years, Malaysia's total R&D expenditure (GERD) has been on an increasing trend. However, it dropped drastically (by 52.8%), from RM 3.6 billion in 2006 to RM 1.7 billion in 2008. The GERD/GDP ratio, a measure of research intensity, dropped from the average of 0.65% in the six year period of 2002-2006 to 0.24% in 2008.
- Analysis by sector shows that the decrease in GERD and GERD/GDP ratio is because of the sharp drop in GERD for the private sector, which declined from RM 3.1 billion in 2006 to RM 535.5 million in 2008. On the other hand, the GERD for the IHLs and GRIs was RM 772.9 million and RM 431.3 million respectively in 2008, which is greater than their GERD in 2006, which was RM 360.8 million and RM 189.5 million, respectively.
- The poor response rate by both the public and private sectors on the NSRD 2008 leaves cause for concern that the survey may not have managed to capture the true R&D expenditure, and that the R&D expenditure in Malaysia is actually much greater than that reported in the survey.

Innovation in the Private Sector

- Between 2005 and 2008, 51.5% of the Malaysian companies surveyed reported that they carried out innovation activities, and a total of RM 410.0 million was spent on innovation in that period. When compared with international countries, Malaysia was ranked 24th on Innovation Competitiveness in the GCI 2010-2011, and 26th on global competitiveness. On the WCY 2010, however, Malaysia was ranked 12th on Innovative Capacity and 10th on world competitiveness.
- When comparing the companies according to ownership, firm size, and turnover, the results of the 2005-2008 survey showed that a higher percentage of innovations were conducted by foreign controlled companies (61.9%), as shown in, large companies (74.3%), followed by small companies (64.3%), and companies with turnovers of over RM 1.0 million.
- On the factors hampering innovation, the majority of the companies cited high innovation cost (40.4%), high cost of finance (40.0%), high risk (32.5%), and lack of appropriate sources of finance (29.1%) as being the major factors. This is followed closely by their perceptions of the market being dominated by established firms (29.6%) and the lack of qualified personnel (28.1%).

Intellectual Property Rights and Balance in Royalties and Licensing Fees

- The increase in the number of patents filed and granted in Malaysia has been impressive. The number of patents filed rose significantly from 262 in 1986 to 5,737 in 2009, while the number of patents granted increased from 6 in 1988 to 3,468 in 2009. In 2009, both patents filed and granted registered positive growth of 6.2% and 35.4%, respectively.
- Patents filing and grants have been dominated by non-Malaysians. The shares of patent filed and owned by foreigners in 2009 were 78.5% and 92.2%, respectively. On the other hand, the number of patent applications made by Malaysians has increased notably, from 864 in 2008 to 1,234 applications in 2009. The share of local patent applications rose steadily from 2.2% in 1987 to 3.3% in 2000, and increased further to 21.5% in 2009.
- Since 2006, local patent applications by universities and research institutes registered a notable increase, largely contributed by the support provided by the government in financing R&D activities. The number of patents filed by universities increased from 1 in 2000 to 42 in 2009. In terms of the share in total local applications, university patent filing share rose from 0.5% in 2000 to 3.4% in 2009, peaking in 2007 at 4.8%. Applications from research institutes are more notable, increasing from 13 in 2000 (representing 6.3% of total local applications) to 148 in 2009 (12.0%).
- Malaysia has consistently experienced deficits in the balance of payments for royalties and licensing fees. The receipts have been small, but rose gradually from RM 68.1 million in 2001 to RM 192.9 million in 2004, and then increased notably to RM 656.0 million and RM 937.0 million in 2008 and 2009, respectively. However, this is far less than the payment made by Malaysia for the usage of imported technology and intellectual property rights. The payments for royalties and licensing fees increased from RM 2,379.0 million in 2001 to RM 3,368.3 million and RM 3,988.0 million in 2004 and 2009, respectively.
- The largest recipient of royalties and licensing fees from Malaysia is the United States, with a 26.5% share of the total payments in 2009. This is followed by Singapore, accounting for 15.7% of the total payments (RM 626.0 million), Japan 14.5% (RM 579.0 million), the UK 12.1% (RM 483.0 million), and Switzerland 4.6% (RM 183.0 million).
- In the professional services, Malaysia has been experiencing persistent deficits. The deficits in the contract and professional services trade widened from RM 0.6 billion in 2001 to RM 2.7 billion in 2005, and expanded further to RM 3.6 billion in 2009. The deficits in this account peaked in 2003 and 2004, registering a deficit of RM 5.1 billion and RM 4.7 billion, respectively.

ICT in Malaysia

- The indicators for ICT infrastructure and access showed increasing penetration rates for cellular telephones and internet access, while that of the DEL showed a consistent decline over the years. The penetration rate for cellular telephones grew by 42.2% from 74.1 per 100 inhabitants at end-2005 to 105.4 per 100 inhabitants at end-2009.
- The broadband penetration rate has also shown an encouraging performance, from 0.2 per 100 households at end-2005 to 31.7 per 100 households at end-2009—in line with the government's efforts to improve ICT infrastructure so as to increase its adoption and reduce the digital divide in the country. Meanwhile, the penetration rate for DEL showed a consistent declining trend to 44.0 per 100 households at end 2009 from 49.5 per 100 households in 2005 due to the increased reliance on cellular telephones and Internet as media of communication.

- The ICT sector benefited from the government's efforts to aggressively promote ICT adoption in its economic and social agenda, particularly the National Broadband Initiatives, which has set the target for the household broadband penetration rate at 50.0% by 2010, and to 75.0% by 2015 under the 10MP.
- ICT spending in Malaysia grew by 5.0%, to RM 44.9 billion in 2009 and is expected to register a higher growth at 6.0% to RM 48.43 billion in 2010.
- The key sectors in ICT spending are: the government sector; the telecommunications sector; and the financial services industry. A total of RM 20.0 billion has been allocated during the 10MP for further development of the ICT sector.

Biotechnology

- The total number of participants in biotechnology has increased to 219 in 2009, with a total expenditure of RM 445.0 million, where 80.0% is funded by the public sector.
- Biotechnology firms focused on healthcare, industrial and agricultural biotechnology while RIs and IHLs participated almost equally in agricultural, healthcare, industrial and other sectors in biotechnology.
- The revenues from biotechnology increased from RM 418.0 million to RM 1.2 billion in 2009.

Trade in Technology

- In 2009, the high and medium-high technology industry together contribute about 50.0% of Malaysia's total manufacturing exports.
- The high-technology industry exports have been consistently dominated by two industrial sub-sectors: office, accounting and computing machinery, and radio, television and communications equipment, contributing to 86.6% of the total high-technology manufacturing exports in 2009.
- Malaysia has consistently exported more high-technology products than it imported but registered a *persistent deficit* in medium high-technology products trade. The trade surplus in high-technology products declined from RM 84.5 billion in 2007 to RM 81.9 billion in 2008 and RM 60.8 billion in 2009. Trade deficit in medium high-technology products reduced slightly from RM 45.4 billion in 2007 to RM 41.8 billion in 2008, and dropped drastically to RM 18.4 billion in 2009.
- In 2008, Malaysia was ranked eighth in the list of top exporters of high-technology in the world. The US Science and Engineering Indicators (2008) ranked Malaysia first in the list of potential future high-technology exporters for smaller developing countries for the years 2005 and 2007.

Publications and Citations (Bibliometrics)

- The number of S&T articles and citations for authors affiliated with Malaysian institutions in international peer-reviewed journals has been increasing at a very rapid rate for the period 2000 to 2009. In 2009, 5,985 articles in S&T and 1,776 in the social sciences were published by authors affiliated with institutions in Malaysia, far greater than those for the year 2000, when there were 1,048 articles in S&T and 94 articles in the social sciences published. This means that the average annual growth of Malaysia's S&T article output for the period 2000-2009 is 52.3%, and is the highest in the world.
- S&T article outputs for the ASEAN region are led by Singapore and Thailand. With the rapid growth, Malaysia's article output in 2009 is higher, for the first time, than that of Thailand. However, even with the rapid growth, Malaysia's share of the world's article output is only 0.5% in 2009.
- The National Higher Education Strategic Plan, which called for the establishment of Apex and Research Universities, has helped to increase the article output and the number of citations for Malaysia.

Public Awareness of S&T

- Malaysians, throughout the years, have reported themselves as being between slightly to moderately interested in the S&T issues surveyed. The level of public interest in most of these issues is varied across the years surveyed, with the exception of their interest in *environmental pollution*, which displays a gradual decline. On the other hand, there is an increase in the percentage of respondents reporting to be interested in *space exploration*, *the use of nuclear power to generate power*, and *economy & commerce*.
- Throughout the years, Malaysians have perceived themselves as having between a *poor* and *average* knowledge of S&T. In the 2008 survey, however, the majority of the respondents reported themselves as having a *weak* knowledge of the issues surveyed.
- The results also show that in terms of attitude towards S&T, Malaysians have been consistently positive. From 1998 to 2004, more than 60.0% of Malaysians felt that S&T has positive effects on *public health*, *individual enjoyment of life*, *standard of living*, and *working conditions*. In 2008, 73.8% of Malaysians agreed that scientific research brings more positive than negative effects. 84.3% agreed that *S&T improves the quality of our lives* and 79.8% agreed that *S&T is very important for the progress of our nation*.
- The 2008 survey also found that Malaysians' level of understanding of S&T varies according to the issues. In 2008, more Malaysians answered correctly the items that have been taught in school such as, "*The earth travels around the sun*" (72.6%) and "*Plants produce the oxygen that we use for breathing*" (76.4%). 81.1% of the Malaysian public also answered correctly the item, "*Smoking causes lung cancer*".
- Malaysia also generally lags behind the USA, Europe, and South Korea on their understanding of S&T. However, it should be mentioned that on the item, "*The earth travels around the sun*", 70.3% of the Malaysians responded correctly, surpassing the Americans (56.0%), Europeans (65.0%) and Indians (68.5%), and are outperformed only by South Koreans (88.5%), while on the item, "*The earth takes 365 days to complete its rotation around the sun*", 65.6% of Malaysians responded correctly, outperforming the Americans by 10.5% and the Indians by 24.6%.

Recent Advancements in the Energy Sector

- A major challenge in the energy sector in Malaysia is to be able to meet the energy supply-demand mismatch as energy demand grew at a higher rate of 28.0% compared to energy supply at 25.7% over the 2003-2007 period.
- Malaysia has embarked on several initiatives to promote efficient utilisation of energy and elimination of wasteful non-productive patterns of energy consumption. According to the Energy Commission, the electricity intensity ratio for Malaysia remained at a high level of around 0.175 MWh/GDP in 2009, reflecting consistently inefficient electricity usage in the country.
- Specific measures have been implemented in the 9MP to promote efficient energy usage, with additional initiatives are introduced in the 10MP. This includes specific initiatives to achieve the objective of energy efficiency in the residential, industrial, township and building sectors.
- The concern for energy security has also expedited the need to step up the R&D activities to explore renewable energy sources, which received substantial focus in the 10MP. It is targeted that renewable energy would contribute about 5.5% of Malaysia's total electricity supply by 2015.