TABLE OF CONTENTS

Page

Declaration i
Acknowledgement ii
Abstract iii
Table of Contents v
List of Illustrations x
List of Tables xi
Abbreviations xii

Chapter 1

1.0 Introduction 1
1.1 Introduction to PETRONAS 2
1.2 Objective of the Study 3
1.3 Significance of the Study 3
1.4 Scope of the study 4
1.5 Research Methodology 4
1.6 A Brief Introduction of Malaysia 5
   1.6.1 Geography 6
   1.6.2 Economy and Industry 7
   1.6.3 Natural Gas 9
   1.6.4 Crude Oil 10
1.7 What is Petroleum? 11
1.8 Differences between oil and gas 12
1.9 Organization of Thesis 13
Chapter 2

2.0 Introduction 17
2.1 Technology 18
2.2 Technological Capability Accumulation 23
2.3 Economic Theory and Technological Capability 27
2.4 Competences and Capabilities 32
2.5 Technological Embodiment 44
2.6 Dimensions of technological capability 45
2.7 Key dimensions of technological capabilities. 48
2.8 Technology capability development mechanisms 50
2.9 Chapter Summary 51

Chapter 3

3.0 Introduction 53
3.1 Research strategy 53
3.2 Design of the study 54
3.3 Methodology (Data Collection) 55
  3.3.1 Case Study Approach 55
  3.3.2 Interview 56
  3.3.3 Documentation 57
  3.3.4 Informal Sources 58
3.3 Research Limitations 58
3.4 Chapter Summary 58
Chapter 4

4.0 Introduction 60
4.1 Malaysian Petroleum Policies 60
4.2 Oil Discovery in Malaysia 63
    4.2.1 The Pre-World War II Era 63
    4.2.2 Pre-Petronas Formation (The Concession Era) 64
4.3 Company Profile 66
4.4 History of Petronas 67
4.5 Upstream Activities 73
    4.5.1 PETRONAS Carigali's History 73
    4.5.2 Domestic Upstream Activities 78
        4.5.2.1 Terengganu 78
        4.5.2.2 Sarawak 79
        4.5.2.3 Sabah 81
    4.5.3 Overseas Upstream Activities. 84
        4.5.3.1 Malaysia-Thailand Joint Development Area 86
        4.5.3.2 Vietnam 87
        4.5.3.3 Sudan 88
        4.5.3.4 India 90
        4.5.3.5 Mozambique 91
4.6 Downstream Activities 92
4.7 Other Activities 96
4.8 The Evolution of The Malaysian Production Sharing Contract

4.8.1 Background

4.8.2 1976 PSCs

4.8.3 1985 PSCs

4.8.4 Deepwater PSCs

4.8.5 Revenue Over Cost PSCs

4.8.6 Non-Traditional PSCs

4.8.7 Government Incentives

4.9 Chapter Summary

Chapter 5

5.0 Introduction

5.1 Case Study 1 – MITCO (Japan) Smart Partnership

5.2 Case Study 2 – ENGEN Ltd

5.2.1 About ENGEN

5.2.2 ENGEN's History

5.2.3 Black Economic Empowerment (BEE)

5.2.4 PETRONAS-ENGEN Integration Initiatives

5.2.5 The BIP Organizational Structure

5.2.6 Staff Exchange

5.3 Case Study 3 – Interview Report

5.4 Case Study 4 - Ruby Discovered

5.5 Chapter Summary

Chapter 6

6.0 Introduction

6.1 Analysis

6.2 Chapter Summary
Chapter 7

7.0 Summary 151
7.1 Further Recommendation 154

Appendix 155

References 168
# LIST OF ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Map of Malaysia to show the location of the various basins</td>
<td>7</td>
</tr>
<tr>
<td>2.1</td>
<td>Neoclassical and Contemporary Views of the Innovating Firm</td>
<td>28</td>
</tr>
<tr>
<td>2.2</td>
<td>Evolutionary Model of a Firm</td>
<td>32</td>
</tr>
<tr>
<td>2.3</td>
<td>An Extended View of Core Competencies</td>
<td>34</td>
</tr>
<tr>
<td>2.4</td>
<td>Approaches to Technology Capability</td>
<td>37</td>
</tr>
<tr>
<td>2.5</td>
<td>Key Elements of Technological Capability</td>
<td>40</td>
</tr>
<tr>
<td>2.6</td>
<td>Technological Change Cycle</td>
<td>46</td>
</tr>
<tr>
<td>4.1</td>
<td>Organization Chart of PETRONAS</td>
<td>72</td>
</tr>
<tr>
<td>4.2</td>
<td>Relationship between Government, PETRONAS and PS Contractors</td>
<td>101</td>
</tr>
<tr>
<td>4.3</td>
<td>Deepwater Production Sharing Contract Situation Map</td>
<td>103</td>
</tr>
<tr>
<td>4.4</td>
<td>Evolution of Malaysia’s PSC</td>
<td>105</td>
</tr>
<tr>
<td>6.1</td>
<td>The Process of Starting a Production Well</td>
<td>139</td>
</tr>
</tbody>
</table>
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Major Economic Indicators</td>
<td>8</td>
</tr>
<tr>
<td>4.1</td>
<td>PETRONAS’ Projects World wide</td>
<td>85</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------</td>
<td></td>
</tr>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
<td></td>
</tr>
<tr>
<td>BEE</td>
<td>Black Economic Empowerment</td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td>British Petroleum</td>
<td></td>
</tr>
<tr>
<td>bpd</td>
<td>barrels per day</td>
<td></td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
<td></td>
</tr>
<tr>
<td>CUF</td>
<td>Centralised Utility Facilities</td>
<td></td>
</tr>
<tr>
<td>EPMI</td>
<td>Esso Production Malaysia Incorporation</td>
<td></td>
</tr>
<tr>
<td>E&amp;P</td>
<td>Exploration and Production</td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
<td></td>
</tr>
<tr>
<td>IPC</td>
<td>Integrated Petrochemical Complexes</td>
<td></td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organization</td>
<td></td>
</tr>
<tr>
<td>IT</td>
<td>Information and Technology</td>
<td></td>
</tr>
<tr>
<td>LNG</td>
<td>Liquefied Natural Gas</td>
<td></td>
</tr>
<tr>
<td>Ltd.</td>
<td>Limited</td>
<td></td>
</tr>
<tr>
<td>LPG</td>
<td>Liquefied Petroleum Gas</td>
<td></td>
</tr>
<tr>
<td>MNC</td>
<td>Multinational Corporation</td>
<td></td>
</tr>
<tr>
<td>MLNG</td>
<td>Malaysia liquefied natural gas</td>
<td></td>
</tr>
<tr>
<td>MNOC</td>
<td>Multinational Oil Companies</td>
<td></td>
</tr>
<tr>
<td>MTBE</td>
<td>Methyl Tertiary Butyl Ether</td>
<td></td>
</tr>
</tbody>
</table>
mmbtu  million British Thermal Unit
mmscfd  million standard cubic feet per day
mtpa  million tonnes per annum
NEP  New Economic Policy
NGV  Natural Gas for Vehicles
NIC  Newly Industrialize Countries
NIE  Newly Industrializing Economics
NOC  National Oil Corporation
OECD  Organization for Economic Cooperation and Development
OPEC  Organization of Petroleum Exporting Countries
PETRONAS  Petroliam Naisonal (The National Petroleum Corporation)
PGU  Peninsular Gas Utilisation
PRSS  Petronas Research and Scientific Services Sdn Bhd
PSC  Production Sharing Contracts.
R & D  Research and Development
S & T  Science and Technology
UNCTAD  United Nations Conference on Trade and Development
www  World-wide web