GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND SUSTAINABLE PERFORMANCE AMONG ISO 14001 MANUFACTURING FIRMS: THE MODERATING EFFECT OF SUPPLY CHAIN INTEGRATION

ROHANI ABDULLAH

UNIVERSITI SAINS MALAYSIA

2016
GREEN SUPPLY CHAIN MANAGEMENT
PRACTICES AND SUSTAINABLE
PERFORMANCE AMONG ISO 14001
MANUFACTURING FIRMS: THE MODERATING
EFFECT OF SUPPLY CHAIN INTEGRATION

by

ROHANI ABDULLAH

Thesis submitted in fulfillment of the requirements
for the degree of
Doctor Philosophy

June 2016
ACKNOWLEDGEMENT

Alhamdulillah, all praises to Allah for the strengths and His blessing in completing this thesis. First and foremost, I would like to express my sincere gratitude to my supervisor, Dr Marini Nurbanum Mohamad for the continuous support of my PhD study, for her patience, motivation, and immense knowledge. Special appreciation also goes to my co-supervisor Prof. T. Ramayah, for his supervision and constant support. His invaluable help of constructive comments and suggestions throughout the research works have contributed to the success of this PhD study. I could not have imagined having the best supervisors for my PhD.

There are so many people have helped me to stay sane through these difficult years and none of this would have been possible without the love, patience and prayers of my family. My late parents; Hajah Zaharah Mohamed and Abdullah Ismail, and my late brother Rosli Abdullah whom this dissertation is dedicated to, have been a constant source of love, concern, support and strength of my life. The loss of my beloved mother and brother during this PhD journey was the hardest challenge which took me sometimes to force myself to move forward to reach this stage, may they be placed among the righteous. I would like to express my heart-felt gratitude to all my family members, especially to my husband Rosley Che Ros, to my children Muhammad Adam Rafiqi, Damia Qaisara, Qaleesya Imaan and Zara Tihani, they are wind beneath my wings.

Last but not least, sincere thanks to my dearest friends especially Mastora, Fardzah, Razmah, Fadhilah, Pei Ling, Ainul, Saleha, Rafizah, Mariana, Rahimi and others for their kindness and moral support during my study. To those who indirectly contributed in this research, your kindness means a lot to me. Thank you very much.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ACKNOWLEDGEMENT</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF CONTENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xiii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>xiv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>xvi</td>
</tr>
</tbody>
</table>

**Chapter 1 INTRODUCTION**

1.1 Background of the Study
   1.1.1 The Issues of Sustainable in Malaysia 4
   1.1.2 Manufacturing Firms in Malaysia 9
   1.1.3 ISO 14001 Certified Firms in Malaysia 11

1.2 Problem Statement 12

1.3 Research Questions 19

1.4 Objectives of Study 19

1.5 Significance of Study
   1.5.1 Theoretical Significance 20
   1.5.2 Practical Significance 21

1.6 Scope of Study 22

1.7 Definition of Key Terms 23

1.8 Organization of the Chapters 25

**Chapter 2 LITERATURE REVIEW**

2.1 Introduction 26

2.2 Evolution of Supply Chain Management (SCM) to Green Supply Chain Management (GSCM) 28
3.3 Development of the survey Instrument
   3.3.1 Items for Green Supply Chain Management Practices 127
   3.3.2 Items for Supply Chain Integration 131
   3.3.3 Items for Sustainable Performance 135
3.4 Control Variables 138
3.5 Questionnaire Design 138
3.6 Pre-test 139
3.7 Data Collection 140
3.8 The procedures used to analyze the data 140
   3.8.1 Structural Equation Model (SEM) 140
   3.8.2 Partial Least Squares Path Modelling (PLS-PM) approach 141
   3.8.3 Why PLS-SEM? 142
3.9 Measurement Model Analysis 144
   3.9.1 Validity 144
      3.9.1(a) Content Validity 144
      3.9.1(b) Construct Validity 145
         3.9.1(b)(i) Convergent Validity 145
            Factor Loading 146
            Variance Extracted (AVE) 146
            Reliability 147
            Composite Reliability (CR) 147
      3.9.1(b)(ii) Discriminant Validity 147
   3.10 Structural Model Analysis 148
      3.10.1 Predictive Power ($R^2$) 148
      3.10.2 Effect Size ($f^2$) 149
      3.10.3 Bootstrapping 149
      3.10.4 Predictive Relevance ($Q^2$) 149
3.11 Moderating Analysis 150
   3.11.1 Determining the Moderating Effect Size 151
3.12 Summary of the Chapter 152

Chapter 4 DATA ANALYSIS 153
4.1 Introduction 153
4.2 Response rate 153
4.2.1 Response Bias
4.2.2 Profile of Manufacturing Firms
4.2.3 Profile of Respondents
4.3 Descriptive Statistics
4.4 Common Method Variance
4.5 Partial Least Square Analysis Results
4.6 Assessment of Measurement Model
4.6.1 Measurement of Reflective Model
4.6.2 Testing Second order Constructs
4.7 Structural Model Result
4.7.1 Model 1: Control Variable Effect Model
4.8 Hypothesis Testing
4.8.1 Model 2: Main Effect Model
4.8.2 The relationship between Green Supply Chain Management Practices and Sustainable Performance
4.9 Moderating Effect Model
4.9.1 Moderating effect- The two stage approach
4.9.2 Moderating effect of Supply Chain Integration on the relationship between Green Purchasing and Social Performance
4.9.3 Moderating effect of Supply Chain Integration on the relationship between Green Purchasing and Economic Performance
4.9.4 Moderating effect of Supply Chain Integration on the relationship between Eco-design and Social Performance
4.10 Assessment of effect size for moderator
4.11 Analyzing Predictive Relevance (Q^2)
4.12 Summary of Hypotheses Testing
4.13 Summary of the Chapter

Chapter 5 DISCUSSION AND CONCLUSION
5.1 Chapter Overview
5.2 Overview of the Research Study
5.3 Recapitulation of Research Findings
5.4 Discussion
5.4.1 Green Supply Chain Management Practices Adoption in Malaysia
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-design</td>
<td>202</td>
</tr>
<tr>
<td>Green Purchasing</td>
<td>204</td>
</tr>
<tr>
<td>Reverse Logistics</td>
<td>206</td>
</tr>
<tr>
<td>5.4.2 The level of Supply Chain Integration in Malaysia</td>
<td>209</td>
</tr>
<tr>
<td>5.4.3 Relationship between Green Supply Chain Management Practices and</td>
<td></td>
</tr>
<tr>
<td>Sustainable Performance</td>
<td>212</td>
</tr>
<tr>
<td>Economic performance</td>
<td>212</td>
</tr>
<tr>
<td>Environmental Performance</td>
<td>215</td>
</tr>
<tr>
<td>Social Performance</td>
<td>218</td>
</tr>
<tr>
<td>5.4.4 The Moderating Role of Supply Chain Integration (SCI)</td>
<td>220</td>
</tr>
<tr>
<td>5.5 Contribution of the Study</td>
<td>223</td>
</tr>
<tr>
<td>5.5.1 Theoretical Contributions</td>
<td>224</td>
</tr>
<tr>
<td>5.5.2 Practical Contributions</td>
<td>227</td>
</tr>
<tr>
<td>5.6 Limitation and Suggestions for Future Research</td>
<td>232</td>
</tr>
<tr>
<td>5.7 Conclusion</td>
<td>233</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>236</td>
</tr>
<tr>
<td>LIST OF PUBLICATIONS</td>
<td>288</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.1</td>
<td>Types of Hazardous Waste Generated by Manufacturing Industry</td>
<td>7</td>
</tr>
<tr>
<td>Table 2.1</td>
<td>Evolution of the Supply Chain Management concept</td>
<td>30</td>
</tr>
<tr>
<td>Table 2.2</td>
<td>Terms of Green Supply Chain Management</td>
<td>32</td>
</tr>
<tr>
<td>Table 2.3</td>
<td>Green Supply Chain Management Practices based on Literature</td>
<td>34</td>
</tr>
<tr>
<td>Table 2.4</td>
<td>Constructs and Items of Internal Integration</td>
<td>75</td>
</tr>
<tr>
<td>Table 2.5</td>
<td>Construct and Items of Supplier Integration</td>
<td>79</td>
</tr>
<tr>
<td>Table 2.6</td>
<td>Construct and Items of Customer Integration</td>
<td>81</td>
</tr>
<tr>
<td>Table 2.7</td>
<td>Summary of Organizational Theories applied to GSCM related study</td>
<td>82</td>
</tr>
<tr>
<td>Table 2.8</td>
<td>GSCM studies in Various Countries</td>
<td>95</td>
</tr>
<tr>
<td>Table 2.9</td>
<td>GSCM studies in Malaysia</td>
<td>104</td>
</tr>
<tr>
<td>Table 3.1</td>
<td>Items for Green Purchasing</td>
<td>128</td>
</tr>
<tr>
<td>Table 3.2</td>
<td>Items for Eco-design</td>
<td>130</td>
</tr>
<tr>
<td>Table 3.3</td>
<td>Items for Reverse Logistics</td>
<td>131</td>
</tr>
<tr>
<td>Table 3.4</td>
<td>Items for Supplier Integration</td>
<td>133</td>
</tr>
<tr>
<td>Table 3.5</td>
<td>Items for Internal Integration</td>
<td>134</td>
</tr>
<tr>
<td>Table 3.6</td>
<td>Items for Customer Integration</td>
<td>135</td>
</tr>
<tr>
<td>Table 3.7</td>
<td>Items for Environmental Performance</td>
<td>136</td>
</tr>
<tr>
<td>Table 3.8</td>
<td>Items for Economic Performance</td>
<td>137</td>
</tr>
<tr>
<td>Table 3.9</td>
<td>Items for Social Performance</td>
<td>138</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>Response rate</td>
<td>154</td>
</tr>
</tbody>
</table>
Table 4.2    Chi-square test for differences between early and late responses
Table 4.3    Results of independent samples t-tests for response bias between early and late responses
Table 4.4    Profile of the responding firms
Table 4.5    Respondent’s Position
Table 4.6    Descriptive Statistics of Variables
Table 4.7    Reliability of reflective constructs
Table 4.8    Discriminant Validity
Table 4.9    Loadings and Cross Loadings
Table 4.10   Goodness of measure for Second Order Construct
Table 4.11   Effect of Control Variable
Table 4.12   Hypotheses Testing: Direct Effects of Green Supply Chain Management Practices on Sustainable Performance
Table 4.13   Hypotheses testing: Moderating effect of Supply Chain Integration on GSCM practices and Sustainable Performance
Table 4.14   Effect size
Table 4.15   Predictive Relevance for Endogenous Variables
Table 4.16   Summary of Hypotheses Testing
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.1</td>
<td>Types of Treatment and Disposal of Waste in Malaysia</td>
<td>6</td>
</tr>
<tr>
<td>Figure 1.2</td>
<td>Total Scheduled Wastes Management 2009-2013</td>
<td>7</td>
</tr>
<tr>
<td>Figure 2.1</td>
<td>Sustainable Performance</td>
<td>51</td>
</tr>
<tr>
<td>Figure 2.2</td>
<td>Theoretical Framework</td>
<td>112</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Model 1: Control Variable Effect Model</td>
<td>163</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Model 2: Main Effect Model</td>
<td>163</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>Model 3: Moderating effect of Supply Chain Integration (SCI) on GSCM practices (GP, ED and RL) and Economic Performance (ECON)</td>
<td>164</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>Model 4: Moderating Effect of Supply Chain Integration (SCI) on GSCM practices (GP, ED and RL) and Environmental Performance (ENVIRON)</td>
<td>164</td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>Model 5: Moderating Effect of Supply Chain Integration (SCI) on GSCM practices (GP, ED and RL) Social Performance (SOCIAL)</td>
<td>165</td>
</tr>
<tr>
<td>Figure 4.6</td>
<td>Research Model</td>
<td>167</td>
</tr>
<tr>
<td>Figure 4.7</td>
<td>Second Order Construct</td>
<td>177</td>
</tr>
<tr>
<td>Figure 4.8</td>
<td>PLS-Algorithm</td>
<td>177</td>
</tr>
<tr>
<td>Figure 4.9</td>
<td>PLS-Bootstrapping</td>
<td>178</td>
</tr>
<tr>
<td>Figure 4.10</td>
<td>Hierarchical Component Model (Second Order Model)</td>
<td>178</td>
</tr>
<tr>
<td>Figure 4.11</td>
<td>Control Variable Effect Model</td>
<td>181</td>
</tr>
<tr>
<td>Figure 4.12</td>
<td>Structural Model Estimation of direct effects</td>
<td>182</td>
</tr>
<tr>
<td>Figure 4.13</td>
<td>Model 3: Moderating effect testing of Supply Chain Integration on GSCM practices and Economic Performance</td>
<td>187</td>
</tr>
<tr>
<td>Figure 4.14</td>
<td>Model 4: Moderating effect testing of Supply Chain Integration on GSCM practices and Environmental Performance</td>
<td>187</td>
</tr>
<tr>
<td>Figure 4.15</td>
<td>Model 5: Moderating effect testing of Supply Chain Integration on GSCM practices and Social Performance</td>
<td>188</td>
</tr>
<tr>
<td>Figure 4.16</td>
<td>Moderating effect of supply chain integration on the relationship between green purchasing and social performance</td>
<td>189</td>
</tr>
<tr>
<td>Figure 4.17</td>
<td>Moderating effect of supply chain integration on the relationship between green purchasing and economic performance</td>
<td>190</td>
</tr>
<tr>
<td>Figure 4.18</td>
<td>Moderating effect of supply chain integration on the relationship between eco-design and social performance</td>
<td>191</td>
</tr>
</tbody>
</table>
LIST OF APPENDICES

Appendix A: Questionnaire

Appendix B: Analysis Results
  
  Appendix B1: Chi Square for profiles of early and late response
  
  Appendix B2: T-test for Differences of Early and Late Responses
  
  Appendix B3: Test of Common Method Variance (Harman Single Factor)
  
  Appendix B4: Demographic Analysis
  
  Appendix B5: VIF values
  
  Appendix B6: Descriptive Analysis
  
  Appendix B7: R Square
  
  Appendix B8: Hypothesis Testing (Direct relationship)
  
  Appendix B9: Moderating Effects
  
  Appendix B10: Predictive Relevance Test
LIST OF ABBREVIATIONS

DOE   Department of Environment
ED    Eco-design
EMR   Environmental Management Representative
EMS   Environmental Management System
ENSEARCH Environmental Management and Research Association of Malaysia
ETP   Economic Transformation Programme
FMM   Federation of Malaysian Manufacturers
GDP   Gross Domestic Product
GP    Green Purchasing
GPNM  Green Purchasing Network Malaysia
GSCM  Green Supply Chain Management
ISO   International Organization for Standardization
KeTTHA Kementerian Tenaga, Teknologi Hijau dan Air
LCA   Life Cycle Analysis
MIDA  Malaysian Investment Development Authority
MITI  Ministry of International Trade and Industry
MPC   Malaysian Productivity Corporation
NRBV  Natural Resource Based View
RDT   Resource Dependence Theory
RL    Reverse Logistics
SCI   Supply Chain Integration
SIRIM Standards and Industrial Research Institute of Malaysia
AMALAN PENGURUSAN RANTAIAN BEKALAN HIJAU DAN PRESTASI LESTARI DI KALANGAN FIRMA-FIRMA PEMBUATAN ISO 14001: KESAN PENYEDERHANAAN INTEGRASI RANTAIAN BEKALAN

ABSTRAK

‘Teori Kebergantungan Sumber’ (RDT) telah dicadangkan untuk menguji teori hubungan amalan GSCM, prestasi lestari dan SCI. Soal selidik melalui mel telah digunakan untuk tujuan pengumpulan data dan sejumlah 152 respons telah diterima dan digunakan dalam data analisis menggunakan SmartPLS 3.0. Keputusan daripada data analisis menunjukkan amalan GSCM seperti pembelian hijau dan rekabentuk eko dapat meningkatkan kesemua komponen prestasi lestari iaitu ekonomi, persekitaran dan sosial, manakala amalan logistik berbalik hanya memberi kesan yang positif kepada komponen prestasi sosial sahaja. Begitu juga dengan kesan penyederhanaan SCI, hasil daripada keputusan analisis hanya menyokong kesan penyederhanaan SCI terhadap hubungan pembelian hijau dan prestasi sosial firma. Secara khususnya, integrasi rantaian bekalan pada tahap yang tinggi menunjukkan keberkesanan amalan pembelian hijau dalam meningkatkan prestasi sosial firma. Secara keseluruhannya, kajian ini mendapati perlaksanaan amalan hijau di kalangan firma-firma pembuatan di Malaysia berada di tahap yang sederhana tinggi serta integrasi rantaian bekalan yang diamalkan juga berada pada tahap yang agak tinggi. Dapatan kajian ini memberi beberapa implikasi kepada sudut perkembangan teori dan aplikasi praktikal yang dapat membantu pengiat industri untuk lebih memahami isu berkaitan amalan pengurusan rantaian bekalan hijau, integrasi rantaian bekalan dan prestasi lestari syarikat. Kajian ini juga turut mengemukakan limitasi kajian serta cadangan untuk kajian-kajian yang akan datang.
GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND SUSTAINABLE PERFORMANCE AMONG ISO 14001 MANUFACTURING FIRMS: THE MODERATING EFFECT OF SUPPLY CHAIN INTEGRATION

ABSTRACT

The increasing awareness and interest in environmental sustainability is creating a pressure on firms to pay more attention on the impact of their industrial footprints to the environment. This pressure is felt more in high polluting industries. In Malaysia, the manufacturing industry is the largest contributor to the country's pollution index. Therefore, any effort to minimize the environmental footprints of this industry will provide considerable improvement in environment protection and sustainable development. Hence, Green Supply Chain Management (GSCM) practices is now gaining popularity as a management approach in facilitating matters related to environmental issues. However, GSCM practices are still less adopted by manufacturing firms in Malaysia since many are not aware of its importance to sustain the business. Thus, this study was conducted among ISO 14001 certified manufacturing firms with the aim to investigate the extent of GSCM practices implementation and the outcomes of its implementation in terms of sustainable performance. This study also sought to ascertain the moderating effect of Supply Chain Integration (SCI) on the relationship between GSCM practices and sustainable performance. To meet these objectives, 18 hypotheses tailored by the theoretical lenses of Natural Resource Based View (NRBV) and Resource Dependence Theory (RDT) were proposed to test the theorized relationship of GSCM practices, sustainable
performance and SCI. A mail survey was used for data collection and a total of 152 responses were received and used for data analysis using SmartPLS 3.0. The results from data analysis showed GSCM practices such as green purchasing and eco-design were found to improve all the components of sustainable performance which include economic, environmental and social, while reverse logistics was found to have a positive impact on social performance only. Similarly, for the moderating effect of SCI, the results from the analysis obtained only supported the moderating effect of SCI on green purchasing and social performance of the firm. In particular, the integration of the supply chain at a high level demonstrates the effectiveness of green purchasing in improving the social performance of firms. Overall, the findings of the study revealed that the implementation of GSCM practices among manufacturing firms in Malaysia can be ranked as moderately high and SCI is also being practiced at considerably high level. This study provides some implications in terms of theory advancements and practical applications that can help practitioners to better understand the issues related to the GSCM practices, supply chain integration and sustainable performance of the firm. The study also highlights limitations encountered and postulate recommendations for future studies.
Chapter 1 INTRODUCTION

1.1 Background of the Study

Environmental degradation has been a major concern for firms since the society increasingly gained awareness of the damage that generated from firms’ unsustainable strategies (Pietro, 2012). The increasing of international environmental regulations and growing consumer concern over environmental protection have demonstrated the importance of environmental management in manufacturing activities (Dangelico & Pujari, 2010). With these increasing pressures, manufacturing firms are forced to actively engage in environmental management in order to meet the requirement of sustainable development (Tseng, Wang, Chiu, Geng, & Lin, 2013). In addition, manufacturing is one of the areas employing the most workforce and having the highest footprint and impact on the community. Owing to the effect of the manufacturing industry has on the society, environment and the economy at large, the industry opened up opportunities to take part in promoting and contributing to sustainability (Cagliano, Golini, & Longoni, 2010).

In reality, organizations generally function through the use of resources and generate emission of toxic wastes into the environment during product manufacturing. Even though these emission is not as significant as compared to the generation of product emission during its life cycle. For instance, the manufacture of durable goods like home appliances and automobiles, the environmental emissions from their use and disposal stages are more significant compared to the emissions in their manufacturing stage. On the other hand, the manufacture of paper towels and aluminum foil, the problem is even worse where the environmental emission is significant in the manufacturing stage as well as in its life cycle (Abdullah, 1995).

As a result, the environmental loads during a product’s life cycle becoming the main concern underlying the current environmental issues (Abdullah, 1995). Despite the efforts
carried out to lessen the environmental problems, the issues are continuously increasing (MGCC, 2006). Effective methods have been proposed to tackle environmental problems. These methods have transformed environmental management from merely the end-of-pipe control and waste treatment (Handfield, Sroufe, & Walton, 2005) to “close the loop” by including the reuse, remanufacturing, and recycling of products and materials (Chin-Chun, Keah, Zailani, & Vaidyanathan, 2013). Therefore, firms have to change from a conventional environmental management paradigm to the more extensive approach of reducing pollution through handling its source at individual stages of the product life cycle (i.e. extraction of raw material, transportation, manufacturing, product use, recycling, and disposal) (Matos & Hall, 2007).

As a consequence, Green Supply Chain Management (GSCM) has been proposed as a novel managerial action upon which firms are enabled to create sustainability in their manufacturing activities by minimizing environmental impact and enhancing ecological efficiency (Pietro, 2012). GSCM refers to all phases of supply chain management that needs to adhere to the environmental protection requirements (Wu, 2013; Zhu & Sarkis, 2007) and can be broadly divided into intra- and inter-organisational environmental practices (Shi, Koh, Baldwin, & Cucchiella, 2012) that involves the cooperation among supply chain members (B.B. Flynn, Huo, & Zhao, 2010). Hence, a firm is basically a part of the supply chain and as such, they should not ignore the rest of the members’ practices and as well as the expectations of and expectations from the stakeholders (Alison, Mike, & Melanie, 2012). Such expectations are increasingly focused on environmentally and socially responsible principles and practice, and these dimensions represented a key focus of the review of today’s business requisite (Alison et al., 2012).

In addition, sustainable performance is among the defining matters as been pointed out by Gordon Brown in his speech conveyed to the United Nations Ambassadors on April 20, 2006 (Brown, 2006):
Environmental sustainability is not an option – it is a necessity. For economies to flourish, for global poverty to be banished, for the well-being of the world’s people to be enhanced – not just in this generation but in succeeding generations – we have a compelling and ever more urgent duty of stewardship to take care of the natural environment and resources on which our economic activity and social fabric depends.

It is thus important to assess business activities on the basis of their impact on the natural environment as this would lead to the minimization of the adverse effect on the environment but it can also integrate environmental aspects into business operations which in turn, result in generating economic benefits to business organizations. Evidence from literature proves that environmental enhancement is good business (Porter & van der Linde, 1995).

In relation to this, business organizations can individually play their role in facilitating sustainable performance by innovating green products and processes by using raw materials more efficiently and concurrently improve their corporate and product image, lessen the risks resulting from environmental responsibility and improving their conditions of working environment. Such innovation may assist in achieving the prosperous economic, environmental as well as societal aims (Svensson, 2007). Moreover, the debate regarding the relationship of manufacturing practices and sustainable performance has taken place in the green supply chain management (GSCM) research area.

GSCM is receiving considerable interest from researchers and practitioners of business operations. In fact, the increasing significance of GSCM is urged by the increasing harmful impact upon the environment. Hence, GSCM is now considered as an effective management tool to lead manufacturing organizations to improve environment sustainability along with other performance target. In addition, Pietro (2012) highlighted GSCM is not only a tool to reduce the negative environmental impact of processes and products but also a distinctive strategy that provides economic benefits and increase environmental performance as well as enhancing the social welfare.

To achieve environmental excellence is a challenging task, because all the related activities in the supply chain require some degree of integration between supply chain
members (Vachon & Klassen, 2008). As contended by Huo, Han, Chen, and Zhao (2015), supplier, customer and internal integration represents an important aspect of supply chain management and have been proven to effectively improve performance. Similarly, Gluch, Gustafsson, and Thuvander (2009) and Luzzini, Brandon-Jones, Brandon-Jones, and Spina (2015) indicated that in order to strengthen core competencies for sustainable development through pollution prevention strategies and product stewardship efforts, firms need to coordinate their internal capabilities and integrate with supply chain members into inter-organisational environmental practices. Yet, previous studies discussing the effects of supply chain integration on GSCM have not recognized the influence of supply chain integration (Carvalho & Barbieri, 2012; Noor Aslinda, Norhayati, Jusoh, Mohd Shoki, & Muhamad Zameri, 2012).

Besides, prior studies related to GSCM practices and performance outcomes showed inconsistency in results (Eweje, 2011). For instance, some studies reported positive relationship between green practices and performance (Schnietz & Epstein, 2005), other studies reported a negative association and insignificant relationship (Barnet & Solomon, 2006; Mill, 2006). The inconsistency results found might indicate the presence of moderating factor that might change the form of this relationship (Baron & Kenny, 1986). Therefore, to fill the gaps in the literature, this study aims to develop a more comprehensive research framework to explore how GSCM practices affects sustainable performance under the moderating effects of supply chain integration. The findings and results of this study will seek to fill the insufficiency of previous GSCM studies and to provide empirical evidence for manufacturing firms to enhance their sustainable performance.

1.1.1 The Issues of Sustainability in Malaysia

In the context of Malaysia, in its mission to be an industrialized economy, the country has shifted from material production to manufacturing (De Beule, Van Den Bulcke, & Zhang,
2014) with the latter sector contributing around 25% of the gross domestic product (GDP) and more than 60% of total exports in the first quarter of 2013 (Trading Economics, 2013b). Generally, the manufacturing sector is considered one of the major contributor after the services sector in Malaysia’s economy. However, the rising of these manufacturing industries has a negative impact upon the environment by causing increases in pollution, waste and the depletion of natural resources. In other words, the main source of environmental problems lies in industry or individual organizations as people nowadays significantly relies on industrial products to maintain their living standards. As a consequence, this results in the detrimental impact upon the environment and the future of human society.

According to the Department of Environment (DOE) report published in 2012, the main environmental problems in Malaysia were found to be water pollution and the disposal of solid waste. Water pollution in the country is typically caused by the discharge of the industries and the activities of farming (Wong, Kee-hung, Lun, & Cheng, 2015). However, the current water and air catastrophe has indicated that these natural resources have to be managed for their sustainability. The indication has posed a new challenge for the country to come up with strategies to secure, manage and govern the conservation of water resources and the quality of air (Afshan, 2013). Aside from this, the next major issue is the solid and hazardous waste (Devadason & Chenayah, 2010). According to MGCC (2010), around 17,000 tons of waste is generated on a daily basis and this is predicted to increase to over 30,000 tons daily by 2020 owing to the population growth. Regardless of the significant level of waste, the recycled portion was only reported to be 5% (MGCC, 2010). Due to lack of awareness and some technical constraints, Malaysia and many other developing countries are still employing conventional approach of end-of-life products, which entail land filling or incineration of waste. Several companies have even turned to illegal dumping that ultimately pollute rivers and lands (Devadason & Chenayah, 2010).
Data from DOE (2012) revealed that a major portion of waste in Malaysia goes to landfill (Figure 1.1), this costly process harms the environment as the exposure to such wastes in landfills generate greenhouse gas (GHG) that contributes to climate change (DOE, 2010). In addition, most of these hazardous waste generated are from manufacturing activities (Jaggernath & Khan, 2015). As evident in Table 1.1 and Figure 1.2, the generation of hazardous waste are keep increasing over the year, therefore a serious approach need to be employed by the stakeholders to address this environmental issues specifically in the sector that contribute the most damage to the natural environment.

![Figure 1.1 Types of Treatment and Disposal of Waste in Malaysia](Source: DOE, 2012)
Figure 1.2 Total Scheduled Wastes Management 2009-2013 (Sources: DOE, 2014)

Table 1.1 Types of Hazardous Waste Generated by Manufacturing Industry

<table>
<thead>
<tr>
<th>No</th>
<th>Type of Industry</th>
<th>Quantity of Waste</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chemical</td>
<td>765,208.44</td>
<td>40.68</td>
</tr>
<tr>
<td>2</td>
<td>Electronic/Electrical</td>
<td>274,582.79</td>
<td>14.6</td>
</tr>
<tr>
<td>3</td>
<td>Licensed Facilities</td>
<td>260,636.76</td>
<td>13.86</td>
</tr>
<tr>
<td>4</td>
<td>Metal/Engineering</td>
<td>166,938.06</td>
<td>8.88</td>
</tr>
<tr>
<td>5</td>
<td>Automotive/Workshop</td>
<td>107,020.65</td>
<td>5.69</td>
</tr>
<tr>
<td>6</td>
<td>Hospital/Pharmaceutical</td>
<td>45,075.48</td>
<td>2.4</td>
</tr>
<tr>
<td>7</td>
<td>Petroleum/Petrochemical</td>
<td>43,847.93</td>
<td>2.33</td>
</tr>
<tr>
<td>8</td>
<td>Others (Food, Glass, Minerals, Plastic etc.)</td>
<td>42,925.97</td>
<td>2.28</td>
</tr>
<tr>
<td>9</td>
<td>Rubbish/Trash</td>
<td>88,679.05</td>
<td>4.48</td>
</tr>
<tr>
<td>10</td>
<td>Paper Based</td>
<td>89,584.77</td>
<td>1.75</td>
</tr>
<tr>
<td>11</td>
<td>Shophousing</td>
<td>33,211.35</td>
<td>1.72</td>
</tr>
<tr>
<td>12</td>
<td>Water Treatment/Drinking Water</td>
<td>90,200.00</td>
<td>4.63</td>
</tr>
<tr>
<td>13</td>
<td>Printing &amp; Packaging</td>
<td>27,328.86</td>
<td>1.46</td>
</tr>
<tr>
<td>14</td>
<td>Paint</td>
<td>99,009.66</td>
<td>5.02</td>
</tr>
</tbody>
</table>

Source: Malaysia Quality Environmental Report 2010, DOE, Ministry of Natural Resources and Environment in Malaysia.
For this reason, the Malaysian government focuses on environmental aspects in its Tenth Malaysia Plan (10MP, 2011-2015) called “Building an environment that enhances quality of life”. The 10th Malaysia Plan details measures to be taken to achieve this goal. The desired quality of life can only be achieved within a stable and well-preserved environment. According to the plan, the Malaysian government will introduce new legislation and incentives to ensure that all industries and consumers comply with the measures necessary to take on the country’s environmental problems. This plan has enhanced awareness and understanding on green practices that are in place and are crucial for a sustainable future.

In addition, through the Economic Transformation Programme (ETP), the government has redoubled its efforts to promote sustainable development (Sustainable Energy Development Authority Malaysia, 2011). ETP is one of Malaysia’s transformation agenda that is built on a platform of sustainability and inclusiveness. To ensure that all Malaysians benefit from the country’s development and that economic growth is sustained over the long-term. The implementation of the plan and its allocation of resources also take into account social needs, such as quality of life, cost of living, safety and security of the country’s citizens and environmental sustainability (Economic Transformation Programme, 2010). The ETP introduced in 2010, includes commitment to sustainability, not only in activities but the impact of development on environment and natural resources (Rahim, 2013). From all the efforts made, this indicates that the government is serious about changing its approach and view towards climate change and environmental issues in Malaysia.

The challenge now is to get local industry players on board to play a role in Malaysia’s green agenda (Sustainable Energy Development Authority Malaysia, 2011). In the face of the environmental challenges that Malaysia is having to cope with, how are the industries responding to this issue? How can they become greener and lessen their environmental footprint while at the same time continuing to grow and deliver goods and
services, as well as jobs to the societies? These arguments signify that Malaysia is facing serious challenges regarding how to balance economic development with environmental sustainability and, therefore, achieve the three components of sustainability: economic, environmental and social performance (Eltayeb et al. 2011). In response to these challenges, organizations, especially the manufacturing industry, have started to adopt environmental management initiatives. However, the adoption of green practices in Malaysia is still at the level of unfavorable (Chin-Chun et al., 2013; Eltayeb et al. 2011) and still relatively far to reach the level necessary to the apprehension of Malaysian green agenda (Chau, 2013). Therefore, any relevant studies are crucial for the understanding of green practices and to identify how green practices can be successfully implemented thus spur the Malaysian green agenda and the sustainability development in the Malaysian manufacturing industry.

1.1.2 Manufacturing Firms in Malaysia

The scarcity of resources and the increased focus on environmental issues have caused the Malaysian Government to enforce environmental incentives and regulations to address environmental problems. Recently, the Malaysian Government introduced the Prime Minister’s Hibiscus Award (Kaur, 2011). Whereby, the award winner will serve as a role model for other firms in the implementation of successful environmental management systems. This effort shows how serious the government in rectifying the issues of environmental in Malaysia.

The issues of environment is building up in Malaysia and with the Ninth Malaysia Plan of 2006-2010, the Malaysian government has placed further emphasis on preventive measures (MIDA, 2007). The preventive measures are in place to mitigate and minimize negative environment impacts at source (including supplier evaluation and environmental certification of suppliers), to intensify and reward efforts for organizations that have products that are free from any hazardous substances and to ensure a sustainable development by
closing the loop with a focus on recycling, remanufacturing and disposal initiatives (Chin-Chun et al., 2013).

It can be clearly seen that the Malaysian Government is really serious in addressing the issues of environment and sustainability development. Responding to this exigency, this study looks at the green supply chain management practices and the extent of supply chain integration that triggered sustainable performance among manufacturing firms in Malaysia. In Malaysia, the manufacturing sector has remained to be an important contributor to the economy. As the second largest contributor to the Malaysian economy, the manufacturing sector has been growing in recent years and now accounts for 25 percent of GDP and more than 60 percent of total exports in 2013 (Trading Economics, 2013a).

However, according to Noor Asiah and Susila (2010), although the manufacturing sector is the second largest contributor to the Gross Domestic Product (GDP) of Malaysia, it is also one of the main contributors to environmental pollution. Essentially, the manufacturing sector is a significant source of environmental pollution especially for water and air pollution. A survey made by the Department of Statistics, Malaysia in 2009 disclosed that the manufacturing sector spent about RM3057.7 million (90.1%) towards environmental protection. This result showed that the manufacturing sector is the highest sector that contributes to environmental vulnerability in Malaysia. Consequently, all the activities in the manufacturing sector that produce pollutants can contribute to poor environmental and social performance.

Therefore, the manufacturing sector has been chosen as a context of the study since this sector is one of the largest contributor to the Gross Domestic Product (GDP) of Malaysia, and also one of the main contributors to environmental pollution (Compendium of Environment Statistics Malaysia, 2012). It is believed that any productivity and efficiency enhancement of the manufacturing sector is especially crucial for the continuous growth and development of the economy (Noor Asiah & Susila, 2010). Thereby, any effort to improve
environmental performance of this sector can also produce substantial benefits to the environmental performance and sustainability development.

1.1.3 ISO 14001 Certified Firms in Malaysia

In the context of Malaysia, Environmental Management System (EMS) is becoming an important tool to identify, monitor and control potential environment impacts and is actually a business requirement for the manufacturing industries (Sreenivasan, Govindan, Chinnasamy, & Gowrie, 2013). One of the EMS series is the ISO 14001. The ISO 14001 standard sets out the criteria for an environmental management system. It does not state requirements for environmental performance, but maps out the outline where an organization can follow to set up an effective environmental management system. The ISO 14001 standard can be used by any organization that wants to improve resource efficiency, reduce waste and drive down costs. The standard can provide assurance to company management, staff as well as external stakeholders that environmental impact is being evaluated and improved. In addition, the ISO 14001 can also be integrated with other management functions and assists companies in meeting their environmental and economic goals ("ISO 14000 - Environmental management," 2013).

The existence of ISO 14001 standard in actual fact driving the evolution towards a time where environmental friendly practices are no longer a voluntary business practice, but rather a competitive need for survival (Jason & Suhaiza, 2009). Owing to the extensive adoption of the ISO 14001 standard, it is predicted that soon the green practices through the implementation of the environmental management system will become the norm among manufacturing Malaysian firms as the advantages are evident. Some of these advantages include public awareness of the firm’s overall operating efficiency, efficient use of natural resources, saving costs via product recycling, enhanced quality of product and service, lower rejects and reworks level, reduced cost of packaging (Jason & Suhaiza, 2009).
In the quest to the transitioning into a more globalized environmental management, firms are increasingly participating in ISO14001. Recently, there has been a notable interest and commitment to enhance environmental management in public as well as private sectors. Based on the report published by the Department of Standards Malaysia, there was a total of 969 ISO 14001 certified Malaysian firms in 2013 (Department of Standards Malaysia, 2013). From which 66 percent or 640 firms are categorized under the manufacturing sector. This indicates that the manufacturing firms account for the major sector holding ISO 14001 certification.

Thus, this study will focus on sampling the perceptions and experience of ISO 14001 certified companies in Malaysian manufacturing industry. These certified companies are selected because they are expected to be involved in implementing GSCM practices and expected to have good knowledge of green practices (Eltayeb et al., 2011). According to Nawrocka, Brorson, and Lindhqvist (2009), ISO 14001 standards serves as the platform for green supply chain and creates business opportunities for going green.

Correspondingly, this justifies the need to choose the manufacturing certified firms in order to be able to answer the main objective of this study regarding the extent of green supply chain management practices that exist in Malaysian manufacturing firms and to further discover the potential of supply chain integration that might influence the effects of GSCM practices on sustainable performance of these manufacturing firms.

1.2 Problem Statement

The study of green supply chain practices in the Asian region typically began in or around 2000 (Abdolhossein et al., 2012; Chin-Chun et al., 2013; Mahmood, Rahman, & Deros, 2011; Tritos, Dotun, & Keah, 2013). One of such study was conducted by Rao (2002), who claimed green supply chain in the South East Asian Region which includes Philippines, Indonesia, Malaysia, Thailand, and Singapore had started to take place whereby more and
more research are called for to bridge the gaps in this area. Even though this area is progressively on the rise and several studies has been devoted to this area but the results are still vague.

For instance, many researchers conducted studies on GSCM practices in Asian countries such as China may experience similar market and social-cultural situation with Malaysia but different industries of different countries are facing different pressure in terms of economic and ecological conditions (Christmann & Taylor, 2001). The argument is also supported by Rao (2002) stated the level and mode of implementation of GSCM practices differ significantly in diverse countries. Therefore, manufacturing industry in Malaysia differed to other countries due to background and its culture. Consequently, this justifies the need to conduct a study relating to green supply chain practices in the Malaysian context with the aim of investigating the perception, challenges and adoption of green supply chain management practices among manufacturing firms.

In Malaysia, there are only a few studies that have been carried out on green supply chain practices, most of the studies found in the literature typically began in the year 2009 (Eltayeb, Zailani, & Ramayah, 2011; Juriah, Nurul Fadhly, Anis Fadzlin, Suzailatuladwini, & Nurzatul Ain, 2013; Moorthy, Yacob, & Arockiasamy, 2012; Ratnasingam, Wagner, & Albakshi, 2009; Savita, Dominic, & Ramayah, 2012). This implies that the concept of green supply chain in Malaysia is still new and developing (Seman, Zakuan, Jusoh, Shoki, & Arif, 2012). Therefore, ongoing studies are really encouraged to further strengthen and improve the existing literature on green supply chain practices in Malaysia. A notable study by Zailani, Jeyaraman, Vengadasan, and Premkumar (2012) claimed there are a lot of firms in Malaysia still at the rear and yet to adopt the green supply chain practices in their business approach.

In addition, Eltayeb and Zailani (2009) claimed that Malaysian fully owned firms have the lowest involvement in green supply chain practices compared to foreign based
firms. The reasons that Malaysian owned firms having the lowest involvement in green supply chain is because green practices are considered a very new concept in Malaysia and many are not aware of its importance to sustain the business, thus the practices are less considered by them. Owing to this barrier, the establishment of the Ministry of Energy, Green Technology and Water on 9th April, 2009 by the Prime Minister, Datuk Sri Najib Tun Razak has pushed business organizations to adopt green practices in their business operations. However, the level of readiness to adopt green practices among Malaysian manufacturing firms is still uncertain (Seman et al., 2012). Therefore, there is a need for future studies to carry out in-depth studies dedicated to the green supply chain management adoption and implementation in the context of Malaysia.

The evidence from the literature also shows that there is lack of agreement on the impact of GSCM on performance outcomes. Previous studies have seen mixed results on the relationships between environmental practices and performance achievement (Zhu & Sarkis, 2007; Chin-Chun et al., 2013; Eltayeb & Zailani, 2009; Tritos et al., 2013). Eventhough the “win-win” argument has been used to rationalize the implementation of environmental practices and performance, yet win-win did not occur in all studies (Zhu, Sarkis, & Lai, 2012). Several studies showed that GSCM practices can improve environmental performance (Geffen & Rothenberg, 2000). Even though the disposition of environmental practice adoption should improve environmental performance, not all studies have shown this to be true (Sreenivasan et al., 2013; Wagner, 2008). Whereas some studies suggest a positive relationship between economic performance and proactive environmental initiatives (Sarkis and Cordeiro 2001), other investigations have found negative relationships (Cordeiro and Sarkis 1997, Bowen et al. 2001; Chin-Chun et al., 2013). This vague relationship between GSCM adoption and the resulting performance signifies the need to further investigate what other factors that can possibly influence these practices-performance relationships.
The study by Zhu et al. (2012) argued that the contradicting findings have the potential to become a hurdle for organizations that intend to implement GSCM. Based on the literature scrutinized, this study suggests three plausible sources of the inconsistency. First, the contradicting findings suggest the influence of moderating variables that might change the strength and direction of GSCM practices and performance relationship (Baron & Kenny, 1986). Second, the type of green supply chain practices implemented can impact performance differently (Azevedo, Carvalho, & Machado, 2011; Tritos et al., 2013). Lastly, there is a variety of performance measures in use and this variation may lead to complex relationship between practices and performance (Zhu et al., 2012). With this impediment in mind, the question arises on the extent of green supply chain management practices being adopted by manufacturing firms in Malaysia, what are the impact of these practices on sustainable performance and what is the possible moderating variable that can influence the practices-performance relationship.

With regard to the moderating variable, this study is motivated to investigate the moderating effect of supply chain integration on the relationship between green supply chain management practices and sustainable performance. Supply chain integration (SCI) has received an immense attention as a crucial means in generating material and knowledge flows and leveraging the performance rooted in a supply chain (Narasimhan, Swink, & Viswanathan, 2010; Swink, Narasimhan, & Wang, 2007). Researchers and practitioners have put much emphasis on the potential of SCI, it is believed that certain performance can be gained through a firm’s efficient internal operations and integrated supply chain networks (Olhager & Prajogo, 2012). Wu (2013) and Chen and Paulraj (2004) also added, research in supply chain management is increasingly based on an integrated view for both upstream and downstream integration.

However, the integration views of supply chain management proposed, merely focuses only on core operational issues rather than matters pertaining sustainable issues.
Indeed, sustainable consciousness has become intertwined with daily life and sound business practices (Pachauri & Reisinger, 2007). Examples have begun to emerge from practice regarding the economic benefits to the adoption of the green supply chain practices. As such, 2003 report by US-based non government institute, LMI research Institute, mentions that:

Firms have generally taken two approaches to greening their supply chains. The first, looks externally to its various suppliers. Suppliers are asked to provide evidence of their operations meeting relevant environmental requirements and evidence of ISO14001 certification. The second approach is an internal examination of how a firm designs, produces, and ships its products (LMI Report, 2003, p. 28).

This implied, any major greening practices would require coordination and integration on the part of the entire supply chain to fully experience the benefit of the supply chain practices. The argument is also supported by Ali, Abdul Razak, Chandran, and Veera (2010) in their study on SCI in the context of Malaysia suggested the greater degree of SCI is strongly associated with high levels of performance. However, very few studies have addressed the issue of supply chain integration on how the integration can improve the potential benefit of green practices in the supply chain management (Swami & Shah, 2013). Thus, this raises a question to be explored, whether SCI can actually influence the impact of green supply chain practices on performance.

In summary, the motivation of the study to investigate the moderating effect of supply chain integration is derived from following justifications:

1. Previous studies on the relationship between green supply chain practices and performance has reported inconsistency in results found (Azevedo, Carvalho, & Machado, 2011; Tritos et al., 2013). Whereby this mixed result might indicate the presence of moderating effects that can possibly change the strength of green supply chain practices and performance outcomes (Baron & Kenny, 1986). Thus, this raises the important question of what other factors can possibly influence this relationship?
2. The findings that further strengthened the basis of supply chain integration as a potential moderating variable is supported by previous studies that have empirically tested the interaction between internal integration and external integration of supply chain is related to specific performance gained (Devaraj et al., 2007). Others have reported that internal integration moderated the effect of external supply chain integration on performance (Barbara, Baofeng, & Xiande, 2010). However the extent of this contingency relationship has been focused primarily on the role of internal, customer and supplier integration separately. Thus, another question is raised to systematically examine the interaction of SCI on the relationship between green supply chain practices and sustainable performance.

3. Most studies consider only operational or business performance as benefit of SCI (Dong-Young, 2013). Thus, there is a need to assess whether SCI is effective in enhancing other types of performance particularly on sustainable performance.

In reliance upon this argument, this study tries to investigate whether SCI can significantly influence the relationship between green supply chain management practices and sustainable performance.

Besides investigating the moderating effect of supply chain integration, this study also tries to find out the outcomes of green supply chain practices in terms of sustainable performance. The sustainability concept has increasingly become important in business operations and supply chain management. Research shows that price is no longer the only guide for competition but ecological, health and welfare benefits are involved collectively (Penker, 2006; Suansawat, 2013). In addition, the ongoing pressure from increased globalization and increased competition, the higher demands for safety and security, environmental protection, lack of scarce resources, social and ethical issues have induced immense pressure on supply chain managers (Cetinkaya et al., 2011). As a result,
manufacturing firms have not only needed to deliver quality products right on time, but they now also have to comply with environmental, economical, ethical and the social pressures placed on the business. However, this compliances cannot be achieved without systematic integration in both upstream and downstream of supply chain (Ageron, Gunasekaran, & Spalanzani, 2012).

There is no doubt that study on the link between green practices and performance measures is no longer a new-fangled, many of the scholars admit that greening supply chain increases competitive advantages, even can lead to higher economic performance (Pietro, 2012; van Hoek, 1999). However, most of the studies, including Rao (2002), Vachon and Klassen (2008) and Pietro (2012) merely investigated the links between environmental management and performance, specifically emphasizing environmental and economic performance but how firms contribute to social interests has emerged as a new challenge faced by the organizations (Suansawat, 2013).

An effective assessment of a sustainable performance passes through the simultaneous evaluation of economic, environmental and social performance. Therefore, the adoption and implementation of green practices should seek to address all the pillars of sustainable performance (Markley & Davis, 2007; Pietro, 2012). However, the previous study on sustainable performance has studied this performance from the point of isolation rather to evaluate the collective performances of sustainable which embraces the economic, environmental and social performance (Andrea, 2013; Bai, Sarkis, Wei, & Koh, 2012; El Saadany, Jaber, & Bonney, 2011; Mohamed & John, 2002; Pradeepa, Lee, & Nelson, 2012). This provides greater clarity and supports for this study to investigate how implementing green supply chain management practices can contribute to sustainable performance.

Overall, the main problem of the research can be stated as follows: “To what extent are Green Supply Chain Management Practices being adopted by manufacturing firms in Malaysia? To what extent is the Supply Chain Integration being implemented among
manufacturing firms in Malaysia? What is the impact of Green Supply Chain Management practices on sustainable performance? And does Supply Chain Integration moderates the relationship between Green Supply Chain Management practices and sustainable performance?

1.3 Research Questions

The presented study attempts to investigate the GSCM practices that are likely to be employed by manufacturing firms in Malaysia and to investigate its potential effects on firm’s sustainable performance with regards to supply chain integration. In particular, this study discusses the issues that are encapsulated in the research questions below:

1. What is the extent of GSCM practices among manufacturing firms in Malaysia?
2. What is the extent of supply chain integration among manufacturing firms in Malaysia?
3. What is the relationship between the GSCM practices adopted by manufacturing firms in Malaysia and sustainable performance?
4. Does supply chain integration moderate the relationship between GSCM practices and sustainable performance?

1.4 Objectives of Study

Specifically, this study is intended to answer the following objectives:

1. To examine the level of GSCM practices of manufacturing firms in Malaysia.
2. To examine the level of supply chain integration of manufacturing firms in Malaysia.
3. To determine the relationship between GSCM practices and sustainable performance.
4. To determine if supply chain integration moderates the relationship between GSCM practices and sustainable performance.

1.5 Significance of Study

Although GSCM has become a significant agenda among researchers, there are still limited studies that investigated GSCM practices and its implementation especially in Malaysian context. In Malaysia, green issues are still new and developing (Norsyahida & Maliah, 2012). Further in-depth studies are needed to provide information on the topic, and moreover, Malaysian firms are still in the learning stage regarding on how to implement GSCM practices in their daily business activities (Rao, 2002).

In addition, the MITI Strategic Roadmap for 2013 and Beyond stated in the report, is to ensure that activities in 2013 will focus more on quality investments and to create quality jobs, while captivating an ecosystem approach to investment promotion to fill the gaps in the domestic value chain (MITI, 2013). Thus, this justifies the aspect of environmental practices in the supply chain is seen to be a crucial approach in developing sustainability of business by involving all the parties in the value chain to conform with the green agenda. Therefore, this study is an empirical study that attempts to investigate the current practices of GSCM implemented by manufacturing firms particularly those that contribute to their sustainable performance and to highlight the significance of supply chain integration in the relationship of GSCM practices towards sustainable performance.

Specifically, the significance of the study is divided into theoretical significance and practical significance. The significance of the study are as follows:

1.5.1 Theoretical Significance

The originality of this study is based on the research framework proposed that attempts to provide directions for future research on green supply chain management, by investigating
and testing a theoretical linkage of new construct that has not previously been tested. In this case, supply chain integration is found to be the new construct to be investigated on the relationship of GSCM practices and sustainable performance. In particular, this study aims to investigate the effects of supply chain integration as a potential moderator on the relationship between GSCM practices and sustainable performance.

This study is believed to be among the first to propose and to predict that the interaction of supply chain integration has a stronger effect on green supply chain management practices towards sustainable performance. The results of the study are expected to provide new evidence that can bridge the gap in theoretical knowledge and to provide some additional input to the body of knowledge.

In addition, this study also addresses an important research gap by identifying and utilizing two organizational theories to support the research framework developed. Green supply chain management field is lacking of strong theoretical basis, which may restrain in-depth understanding of this complex phenomenon. Through drawing upon two different theoretical basis of Natural Resource Based View (NRBV) and Resource Depencence Theory (RDT), this study offers a new angle to study green supply chain management practices. A single theory may have very limited explanatory power. Instead, combining the doctrines from different theories can generate a thorough understanding and a more complete idea that can improve theoretical rationale for existing linkages among variables of the study.

### 1.5.2 Practical Significance

Manufacturing firms can benefit from the current study in several different ways. First, developing appropriate strategic priorities is critical to the successful implementation of green supply chain management practices. The results from the study will provide suggestions to the managers on how to successfully implement green supply chain management practices towards sustainable performance.
The findings will be useful in helping manufacturing firms to determine effective indicators of GSCM practices that can contribute to sustainable performance. In addition, an appropriate combination of existing sets of indicators of green practices and its potential performances can help firms gain a more comprehensive picture of environmental effects across their value chain and its product lifecycle. The firms along the supply chain can make use of the comprehensive and consistent green supply chain practices developed by this sustainable research framework. Closer integration of the supply chain could benefit the policy makers and accelerate the efforts towards sustainable development. In addition, by highlighting the effects of Malaysian Green Supply Chain practices on the sustainable performance of ISO 14001 manufacturing firms in Malaysia, the research framework proposed is expected to help managers to recognize and control the effects of the GSCM practices towards sustainable performance. All in all, this study seeks to ease the issue of environmental degradation in the manufacturing industry.

1.6 Scope of Study

To achieve the objectives of the present study, the study focuses on ISO 14001 certified manufacturing firms in Malaysia and extending the knowledge in the GSCM literature. The reason why this type of firms is selected is because the ISO 14001 certified firms were expected to adopt green practices within their operations; this argument is also supported by Zhu et al. (2008) and Fadhilah (2015). Another reason why manufacturing industry is selected is because the industry is found to be the main contributors to environmental deterioration (Fadhilah, 2015; Rusli, Rahman, & Ho, 2012) and the fact that the industry constitutes the largest sector on the basis of sales, employment and economic contribution and a tremendous contribution to the quality and environmental problems in Malaysia. Therefore, any effort to improve environmental performance of this sector can also provide significant benefits to sustainable development of the nation.
1.7 Definition of Key Terms

**Supply chain:** is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hand of the ultimate consumer (Christopher, 1998).

**Green Supply Chain:** incorporating environmental thinking into supply chain management by including activities from cradle to the grave of the products such as product design, material sourcing and selection, manufacturing process, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life (Srivastava, 2007).

**Green Supply Chain Management Practices:** a set of endeavors or efforts undertaken by a firm that aim to minimize negative environmental effects associated with the entire life cycle of its products or services starting from design of the product, acquisition of raw materials, product use, up to the final disposal of the product (Zsidin & Siferd, 2001).

**Green purchasing:** it is environmentally-consious purchasing practice that ensure that the purchased products or materials meets environmental objectives set by the purchasing firm, such as reducing sources of waste, promoting recycling, reuse, and resource use reduction (Min & Galle, 2001).

**Eco-design:** refers to actions taken during product development, aim at minimizing a products environmental impacts during its whole life cycle from acquiring materials, to manufacturing, use and ultimately to its final disposal (Eltayeb et al., 2011).
**Reverse Logistics:** refers to the activities performed by a firm to take back its products, or parts of it, from the point of consumption to the point of origin for the purpose of recycling, reuse, remanufacture, repair, refurbishing, or safe disposal (Carter & Ellram, 1998).

**Supply Chain Integration:** refers to the collaboration of a firm with its supply chain members to manage both intra- and inter-organizational environmental practices (Wu, 2013).

**Supplier Integration:** supplier integration refers to the collaboration of a firm with their suppliers to manage environmental practices (Wu, 2013).

**Internal Integration:** internal integration refers to a firm’s practices of combining and improving internal resources and information in order to generate knowledge sharing beyond the boundaries of individual functions or departments, to assist external integration initiatives, and to achieve organizational goals (Zhao, Huo, Selend, & Yan Yeung, 2011).

**Customer Integration:** customer integration refers to the collaboration of a firm with their customers to manage environmental practices (Wu, 2013).

**Sustainable Performance:** sustainable performance relates to the firm’s ability to perform not just on the economic performance but also on the environmental and social performance (Elkington, 2004).

**Environmental performance:** environmental performance relates to the firm’s ability to reduce air emissions, effluent waste and solid wastes and the ability to decrease consumption of hazardous and toxic materials (Zhu et al., 2008).