EMPIRICAL STUDY ON THE RELATIONSHIPS BETWEEN GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE

BY

CHIN SI MEI
LING SING YAE
TOO JIA WEN
TOONG SIEW KUAN
VIVIAN LAI JIA YIN

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

(4) The word count of this research report is 10,567.

Name of Student:	Student ID:	Signature:
1. Chin Si Mei	09ABB03836	_____
2. Ling Sing Yae	09ABB03108	_____
3. Too Jia Wen	09ABB03016	_____
4. Toong Siew Kuan	09ABB03266	_____
5. Vivian Lai Jia Yin	09ABB03080	_____

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LIST OF ABBREVIATIONS

CFA	Confirmatory Factor Analysis
DV	Dependent Variable
EPI	Environmental Performance Index
GP	Green Purchasing
GSCM	Green Supply Chain Management
IEM	Internal Environmental Management
IR	Investment Recovery
IV	Independent Variable
MLR	Multiple Linear Regressions
N-RBV	Natural-resource Based View
OP	Organizational Performance
PES	Proactive Environmental Strategy
RBV	Resource-based View of The Firm
RL	Reverse Logistics
SAS	Statistical Analysis System
SC	Supply Chain
SCM	Supply Chain Management
TDM	Total Design Method
VIF	Variance Inflation Factor
YCELP	Yale Center for Environmental Law & Policy

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PREFACE

Manufacturing firms started to explore green initiatives by implementing green supply chain management (GSCM) in line with the concern regarding environmental issues in the New Economic Model declared by Dato' Seri Najib Tun Abdul Razak, Prime Minister of Malaysia in the budget speech for 2010.

It is expected that the implementation of GSCM can benefit manufacturing firms in many ways, including improved environmental performance, economic performance as well as operational performance.

Therefore this research is to investigate the relationship between the five GSCM practices, namely Internal Environmental Performance, Eco-design, Investment Recovery, Green Purchasing and Reverse Logistics, and Organizational Performance to find out which practices have higher significance.

We hope that the results of this research combined with further clarification of the results will provide a solid foundation on which GSCM practices to be focused, encouraging greater adoption of GSCM in manufacturing firms.

ABSTRACT

Over the past several decades, the concept of supply chain (SC), an integrated supply base of the upstream and downstream portions has gained a momentum as new forms of organization. With the 'green' component adding into the supply chain management (SCM), it addresses the influence and relationship between SCM and natural environment. Our government has placed a great concern on environmental issues, hence green supply chain management (GSCM) is expected to become a norm among the Malaysian manufacturing firms soon. Hence, this paper attempts to examine the linkages between practices and performances within the field of GSCM practices in Malaysia, namely internal environmental management (IEM), eco-design (ED), green purchasing (GP), investment recovery (IR) and reverse logistics (RL). This study is able to provide insights for the management with a list of GSCM practices that can be adopted as directions to set up appropriate policies as a way to enhance the quality of products and competitiveness in the business. For this purpose, a theoretical model is built from literature sources and natural-resource based view (N-RBV) of the firm is adopted as theoretical foundation since the three strategic capabilities from the N-RBV perspective are congruent with the GSCM concept. Data is collected using a structured questionnaire mailed to a population of 329 of International Organization for Standardization 14001 certified manufacturing firms in Malaysia in which the source is provided by The Federation of Malaysian Manufacturers Directory 2009. Data analysis techniques that will be used in this study are descriptive statistics and inferential analysis, namely Pearson Correlation Analysis, correlation coefficient and Multiple Linear Regressions.

CHAPTER 1: INTRODUCTION

1.0 Introduction

This research aimed to identify the antecedents that lead to improvements in Malaysian manufacturing firm organizational performance. This chapter started with a brief background which consisted of the importance of addressing environmental concern in an organization and how green concepts can be applied into a supply chain. Subsequently, research problems, research objectives and contributions of the research were identified.

1.1 Research Background

Over the past several decades, the concept of supply chain (SC), an integrated supply base of the upstream and downstream portions (Melnyk, Lummus, Vokurka, Burns, & Sandor, 2008) had gained a dominant position as new forms of organization such as virtual industries, global manufacturing and logistic evolution (Arzu & Erman, 2010).

However towards the inception of 21st century, issues of natural environment had substantially grabbed the public's attention. Realizing that long-term sustainability goals depends not only on profitability (Tan & Zailani, 2010), manufacturing firms started to explore green initiatives by implementing green supply chain management (GSCM) as their strategic weapons (Emmett & Sood, 2010; Min & Kim, 2012; Srivastava, 2007).

Based on the statistics from Yale Center for Environmental Law & Policy (YCELP), Malaysia had been placed 25th out of 132 countries in Environmental Performance Index (EPI) 2012 (Yale Center for Environmental Law & Policy, 2012). Hence, in line with the concern regarding environmental issues in the New Economic Model declared by Dato' Seri Najib Tun Abdul Razak, Prime Minister of Malaysia in the budget speech for 2010, together with the adoption of the ISO 14001, it was expected that the implementation of GSCM, with the 'green' components adding into the SC (Srivastava, 2007), will soon become a norm among the Malaysian manufacturing firms (Tan & Zailani, 2010) in which the benefits included improved environmental performance and stakeholder satisfaction, increased capacity to go beyond waste reduction as well as gaining competitive advantage (Curkovic & Sroufe, 2011; Melnyk et al., 2008; Srivastava, 2007).

1.2 Problem Statement

1.2.1 Research Problems

Researchers had questioned whether the traditional SCM was well suited to the company's operation today as the environmental sustainability had been an important issue to business practice (Van Hoek, 1999; Kumar & Chandrakar, 2012). Bhagwat and Sharma (2007) had evaluated SCM as a source of increasing operating cost and Halldorsson, Kotzab, and Skjott-Larsen (2009) had been argued that SCM had a material influence as a facilitator of globalization and can be seen as among the causes of the problem rather than a feasible solution. As cited in Lee and Klassen (2008), managers of companies had realized that a substantial

environmental risk can be found in their company's SCM (Handfield et al., 2005).

1.2.2 Past studies

As cited in Zhu, Geng, Fujita, and Hashimoto (2010), few researchers found that GSCM practices had significant improvement on environmental performance (Hanna, Newman, & Johnson, 2000; Russo & Fouts, 1997), operational performance (Szwilski, 2000; Tooru, 2001), economic performance (Bowen, Cousins, Lamming, & Faruk, 2001) in Japanese manufacturing firms. Different firms had different key drivers to motivate them to adopt GSCM. Some empirical studies showed that senior managers' support and commitment (Zhu, Sarkis, & Lai, 2008b), and environmental compliance or auditing program (Vachon & Klassen, 2006) were important for successful implementation of GSCM. Besides, Green Jr, Zelbst, Meacham, and Bhadauria (2012) asserted that green purchasing could improve environmental performance; eco-design could minimize the product's environmental impact (Eltayeb & Zailani, 2009); while investment recovery and reverse logistic could turn surplus assets into revenue (Hernandez, Poler, Mula, & Lario, 2010; Kumar & Chandrakar, 2012; Zhu, Sarkis, Cordeiro, & Lai, 2008a).

1.2.3 Deficiency in Past Studies

From the review of past studies, there was a lack of research addressing GSCM issues using quantitative approach in Malaysian context. Most of the past studies were tested in Asian countries, such as Japan and China

(Zhu & Sarkis, 2004; Zhu et al., 2010). Due to the wide range of green initiatives under green SC, other less adopted GSCM practices such as Reverse Logistic (RL) and internal environmental management (IEM) should be included together in a study to uncover the importance for overall improvement activities. For example, RL had well procedures and the related action would be to keep at that implementation level, while in IEM, extra procedures may need to be enforced to make sure the level of implementation of RL can be maintained (Zhu et al., 2008b).

1.3 Research Objectives & Questions

Table 1.1: Research Questions and Objectives

General Research Objective	General Research Question
The general research objective is to examine whether the implementation of GSCM practices can improve Malaysian manufacturing firm organizational performance.	Will the implementation of GSCM practices in Malaysian manufacturing firms improve organizational performance?
Specific Research Objectives	Specific Research Questions
The specific research objective is to analyze the relationship between Internal Environmental Management (IEM) and organizational performance.	What is the relationship between Internal Environmental Management (IEM) and organizational performance?
The specific research objective is to analyze the relationship between Eco-Design (ED) and organizational performance.	What is the relationship between Eco-Design (ED) and organizational performance?

The specific research objective is to analyze the relationship between Green Purchasing (GP) and organizational performance.	What is the relationship between Green Purchasing (GP) and organizational performance?
The specific research objective is to analyze the relationship between Investment Recovery (IR) and organizational performance.	What is the relationship between Investment Recovery (IR) and organizational performance?
The specific research objective is to analyze the relationship between Reverse Logistic (RL) and organizational performance.	What is the relationship between Reverse Logistic (RL) and organizational performance?

Source: Developed for the research

1.4 Significance of the studies

1.4.1 Practical contribution

This research paper will be a significant endeavor in increasing environmental awareness on importance of recycling or go green philosophy among supply chain partners. The firms can gain from the development of effectual scales to assess the implementation of GSCM practices which can be used in benchmarking and continuous improvement. It was important to management because they will know what aspects to look at in order to enhance products' quality and the firm's

competitiveness in the business as well as the pros and cons of each GSCM practices implemented.

1.4.2 Theoretical contribution

The proposed study can be a useful source to future researchers as it had laid a good foundation in advancing the theory related to green concept. Also, this paper provided several areas which researchers could focus on, such as employing and assessing multi-item potential constructs via field-based testing (Malhotra & Grover, 1998; Zhu et al., 2008b). In addition, this research was an extended model of past researchers (Zhu, Sarkis, & Geng, 2005; Zhu et al., 2010), this was because past studies mentioned above did not examine all the independent variables (green purchasing, investment recovery, eco design, internal environmental management and reverse logistics) in one research and tended to stress on one or few prospects only.

1.5 Outline of the study

Chapter 1 introduced what GSCM was all about, described the problems, identified the research purpose and questions and provided the importance of the proposed study. Next in chapter 2, introduced the concepts of the theory and its relevance to the research paper, reviewed the prior empirical studies, formed a conceptual framework and developed hypothesis. Lastly, in chapter 3, described how the research was carried out by explaining research design, methods of data collection, sampling design, operational definitions of constructs, measurement scales and methods of data analysis. Lastly, chapter 4 presented data analysis and

chapter 5 demonstrated the discussion, implications and conclusion of the research.

1.6 Conclusion

This chapter allowed researchers to have a brief understanding about the relationship between the IVs and dependent variable (DV) in this study. Also, an overview of research objectives, research questions as well as hypotheses to be tested. The next chapter provided a summary of significant findings from past studies and developed a theoretical conceptual and hypothesis testing.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In this chapter, a summary of past empirical studies explaining the relationship between each IV and DVs were included as well as the theory and its dimensions were discussed. Besides, a conceptual framework that provided the theoretical foundation was developed. Lastly, hypotheses were formulated and tested scientifically in later chapter.

2.1 Review of the Literature

2.1.1 Organizational Performance (Dependent Variable)

The DV in this study was organizational performance which included economic performance, environmental performance and operational performance. According to Green Jr et al. (2012), a good indicator of environmental performance should lead to cost saving which in turn improving economic performance. Together, environmental performance and economic performance should improve operational efficiency. Besides, environmental, economic, and operational performances that yielded cost savings facilitated organizational performance as a whole.

Economic performance was defined as ability of manufacturing firms to minimize costs when purchasing materials, consuming energy and

discharging waste (Zhu et al., 2008a). However, economic performance cannot be observed in short-term sales performance and profitability. Thus, proactive GSCM practices able to prepare the firms for long-term performance through the improvement of environmental risks (Zhu et al., 2010). Environmental performance was the manufacturing firms' ability to reduce wastes and decrease release of pollutants (Zhu et al., 2008a). It was able to evaluate the activities, processes, hardware and services of GSCM practices (Hervani, Helms, & Sarkis, 2005). Therefore, with GSCM practices, environmental and economic performance can be realized by modifying the current policies and launching effective recovery system (Li, 2011). Operational performance linked to the organization's ability to efficiently produce and send products to customers (Zhu et al., 2008a). Operational performance acted as an internal business process which determined the critical manufacturing processes in order to fulfill customer's value and improve economic performance (Shi, Koh, Baldwin, & Cucchiella, 2012).

2.1.2 Relationship between Internal Environmental Management (IEM) and Organizational Performance

As cited in Zhu et al. (2005), Zhu and Sarkis (2004) had pointed out that IEM constituted one of the main internal and external activities within SCM, was a way of developing GSCM as a strategic organizational weapon through support from managers (Ruiz-Tagle, 2008; Zhu et al., 2005).

Lopez-Gamero, Molina-Azorin, and Claver-Cortes (2011), had examined hotel managers' environmental behaviors to examine whether external and

internal elements lead to acceptance of an environmental management. Managers who were accountable for their decisions substantially regulate the environmental commitment of their organization. The method carried out was postal survey sending to environmental manager of three-to-five star Spanish hotels while the analysis techniques used were structural equation modeling, reliability test, chi-square test and descriptive statistics. In short, proactive environmental management was positively related to the improvement of environmental performance, competitive advantage as well as financial performance.

Besides, the interactive effect of elements on a proactive environmental strategy (PES) and organizational performance was investigated in Menguc, Auh, and Ozanne (2010). The top management support in PES was significant because gaining the support of top management was essential for a proactive environmental strategy's success. The population consisted of 325 firms of New Zealand's major manufacturing firms operating in different industries. The analysis techniques used included post-hoc analysis, descriptive statistics and inter-correlations and confirmatory factor analysis (CFA). This study had found out that entrepreneurial orientation (innovativeness, risk-taking) has influence on PES because an organization was probably not pursuing PES unless superiors encouraged it which in turn benefited sales and profit growth.

Since IEM included environmental auditing programs (Zhu et al., 2010), Shih, Chen, and Chen (2006) studied the divergences of internal auditors' behaviors toward environmental protection, environmental inspection and environmental knowledge. The population of this study was made up of internal auditors in Top 1000 and Top 500 public listed and organizations in manufacturing and service industry respectively. The analysis

techniques used were descriptive statistics and Mann-Whitney U-Test and T-test for equality of means. All in all, internal auditors in manufacturing sector had better environmental knowledge than those in service sector to improve the sustainable development of the organization.

2.1.3 Relationship between Eco-Design (ED) and Organizational Performance

ED was defined in this study as ecological design which processed the environmental factors into the development and product design (Yung, Chan, So, Wong, Choi, & Yue, 2011). ED had reduced material application, improved energy saving and made the business more environmental-friendly (Boonkanit & Kengpol, 2010).

Based on Eltayeb, Zailani, and Ramayah (2011), the purpose of the research was to study the result of actual environmental, economic and intangible outcome by adopting GSCM practices which included ED. This study conducted by mailing questionnaire to 551 ISO 14001 certified Malaysian manufacturing organizations. The analysis techniques used were descriptive statistics, validity & reliability test and One-way ANOVA. It is found that GSCM practices had influence on organizational performance outcome in which ED had a direct link to the firm's internal performance.

Furthermore, in Zhu et al. (2010), GSCM practices (including ED) were being introduced to the large Japanese manufacturers. 12 large Japanese manufacturers were contacted and 9 agreed to be involved in this research. Descriptive statistics was used as analysis technique in this study. In short,

it shown that GSCM practices had significant effect in the environmental and financial performance improvement of manufacturing firms.

In Zhu et al. (2008a), it examined the correlation of organizational learning and management support by implementing GSCM practices, including ED in the Chinese manufacturing firms. Researchers used mails and telephone calls to 1000 manufacturers of Dalian and at the end 314 responded to the survey. The analysis techniques used were descriptive statistics, ordinary least squares estimation. The finding revealed that the implementation of GSCM practices (including ED) had significant effect on the environmental, economic and organizational performance of a firm.

2.1.4 Relationship between Investment Recovery (IR) and Organizational Performance

In Zhu et al. (2008a), IR associated to the use of recycling, redisposition and resell to gain better value from end products by selling idle assets scraps (waste materials, excess capital equipment and excess inventories and materials).

In Rogers, Rogers, and Lembke (2010), the purpose of the research was to study the importance of secondary market in US economy and company. The method used was Dephi technique, involving the experts interviewed the independent and anonymous interviewees to develop a consensus. The result showed that secondary market outlets had a large percentage of shopping options in US market. It was clearly proved that secondary market can improve company's environmental and economic performance by recapturing value of unwanted items and reducing landfill costs.

In Jacobs and Subramanian (2012), the purpose of the research was to examine the environmental and economic performance of IR within supply chain. The research method used was two-echelon model which consisted of a supplier and a producer to determine the influence in integrated and decentralized supply chains. The finding of this research showed that IR can improve profit and reduce environmental impacts.

In Zhu, Sarkis, and Lai (2008c), the purpose of this research was to evaluate company perceived of GSCM practices (including IR), capabilities of company on adoption of GSCM practices and the contribution of IR towards company's performance. 314 surveys were collected from respondents who were working in chemical & petroleum, electrical & electronic and automobile sectors. The analysis techniques used included chi-square test, reliability test, descriptive statistics, CFA, one-way analysis of variances. The result showed that Chinese manufacturers were deficient in knowledge, experience and equipment to improve their environmental performance by adopting GSCM practices. Besides, it showed that IR had significant environmental and economic benefits to company.

2.1.5 Relationship between Green Purchasing (GP) and Organizational Performance

According to Ho, Dickinson, and Chan (2010), GP involved acquiring of products or services that were able to minimize environmental impact, fulfill the social responsibility and ethics. As cited in Sarkis (2003), environmental purchasing was defined as a series of procurement

activities which involved reducing, reusing and recycling of materials (Salam, 2011).

Salam (2011) analyzed the determinants of adoption of green procurement of ISO 14001 certified electronic industry in Thailand. However, it had proved that adopting green purchasing with firm's supplier can improve the organizational performance as well as the overall performance of the supply chain. 150 questionnaires are randomly sent to ISO 14001 certified targeted companies listed in Benchmarks Electronics (Thailand) supplier and customer directory. The analysis techniques used were descriptive analysis, reliability test, Pearson Correlation and multiple regression test. It showed the importance of green procurement to gain competitive advantage over competitors.

Another study from Rao and Holt (2005) identified the relationship between the adoption of GSCM (including GP) and improvement in economic performance and competitiveness. Survey was sent to ISO 14001 certified companies in South East Asia, including Philippines, Indonesia, Malaysia, Thailand and Singapore. The analysis techniques used were chi-square test and normality test. The result concluded greening the supply chain was significant to competitiveness and economic performance.

The study conducted by Carter, Kale, and Grimm (2000) studied the relationship between green purchasing and organizational performance. In this research, survey was sent to 1083 managers from consumer product manufacturing industries. The analysis techniques used were multiple linear regression. Result showed there was a positive relationship between green purchasing and organizational performance.

2.1.6 Relationship between Reverse Logistics (RL) and Organizational Performance

Daugherty, Autry, and Ellinger (2001) defined RL as a procedure of planning, enforcing and operating the efficient, cost-effective run of materials, work-in-process, finished goods and information from usage point back to beginning point to recapture value and for proper disposal.

Daugherty et al. (2001) studied the relationship of RL which was tested on effectiveness of RL programs and their impact on business operation. 212 questionnaires are sent to the retailers of selling electronics products by using self-administered mail survey. The analysis techniques used were analysis of non-response bias, descriptive analysis and Pearson Correlation. The result showed that RL program had both direct benefits (effective utilization of inventory) and indirect benefits (better corporate image and improved level of customer satisfaction) to the firm.

Chan and Chan (2008) had focused on the proper implementation of RL system which resulted in customer loyalty and minimization of operational cost. The survey had conducted by mailing to 100 Hong Kong mobile phone organizations and together with follow-up interview of 34 managers in that industry. The analysis technique used was descriptive analysis. Result proved that implementation of reverse logistics system can achieve greater customer loyalty and lower operational cost.

Tan and Kumar (2006) introduced decision-making framework for manufacturers in RL operations to maximize profits. This research used data collected from a computer producer with handling returns of volumes transacted over 2 years. The analysis techniques used were behavior

reproduction tests, repeatability, transparency, dimensionality, process reliability, time step and descriptive statistics. Transportation lag and supplier delay in processing returns had an essential influence on the viability of reverse logistics irrespective of return volumes which in turn affect the profitability of the company.

2.2 Theoretical Foundation

2.2.1 Introduction to N-RBV

The natural-resource based view (N-RBV) of the firm was adopted as theoretical foundation for this study (Hart, 1995), an adaptation of the resource-based view of the firm (RBV). However, RBV ignored the constraints imposed by environment (Brown, Kane, & Roodman, 1994; Meadows, Meadows, & Randers, 1992). Therefore, Hart (1995) developed N-RBV to fill in the gap by stressing organization's relationship to environment. Hart (1995) proposed a three-part framework for N-RBV, namely pollution prevention, product stewardship, and sustainable development.

2.2.2 Three Dimensions of N-RBV

Pollution prevention focused on firm's pressure to reduce or eliminate waste from organization's operation (Hart, 1995). Smart (1992) emphasized that pollution prevention may increase productivity, reduce organization's conformity costs and also enhance profitability of organizations.

Product Stewardship implied that the "voice of environment" and stakeholder perspective were taken into account of eco-design and development processes (Allenby, 1991; Fiksel, 1993), from assessing raw material, production processes, to disposition of used products (Hart, 1995).

Sustainable development required firm to have a solid sense of social-environmental responsibility (Strikker, 1992; Welford, 1995) to develop low-impact technologies for market development (Jansen & Vergragt, 1992). Sustainable development involved a clear future vision and focused on modern technology development (Hart, 1995).

2.2.3 The Relationship between Three Dimensions of N-RBV

According to Hart (1995), if there was no pollution-prevention, product stewardship will not be successfully adopted. The first demonstrated competence in product stewardship need to be dependent to have a successful sustainable development. Sustainability development strategy can be added step by step in which the foundation will be provided by pollution prevention and product stewardship (Hart & Ahuja, 1994).

2.2.4 The Relationship between Three Dimensions of N-RBV, IV and DV

2.2.4.1 Pollution Prevention

Managers had to know the extent of organizations' consequence on environment and understand that contamination came from inefficient use of resources (Hart, 1995). It depended on the commitment from managers to ensure the effectiveness of pollution prevention system (Cole, 1991). Besides, it needed employee involvement and continuous improvement of emissions minimization which in turn can improve the firm's environmental performance (Hart, 1995).

2.2.4.2 Product Stewardship

Eco-design (ED) was necessary in order to achieve an effective product stewardship (Hart, 1995). Zhu et al. (2008b) defined ED as dealing with the product functionality to reduce the life-cycle environmental impact. Consequently, this will affect the company's environmental performance.

Min and Galle (2001) found that Green Purchasing (GP) can minimize the wasted sources and recycling of purchasing materials that adversely affect performance requirements. Thus, GP can significantly influence the performance of environmental and improve the company's economic position.

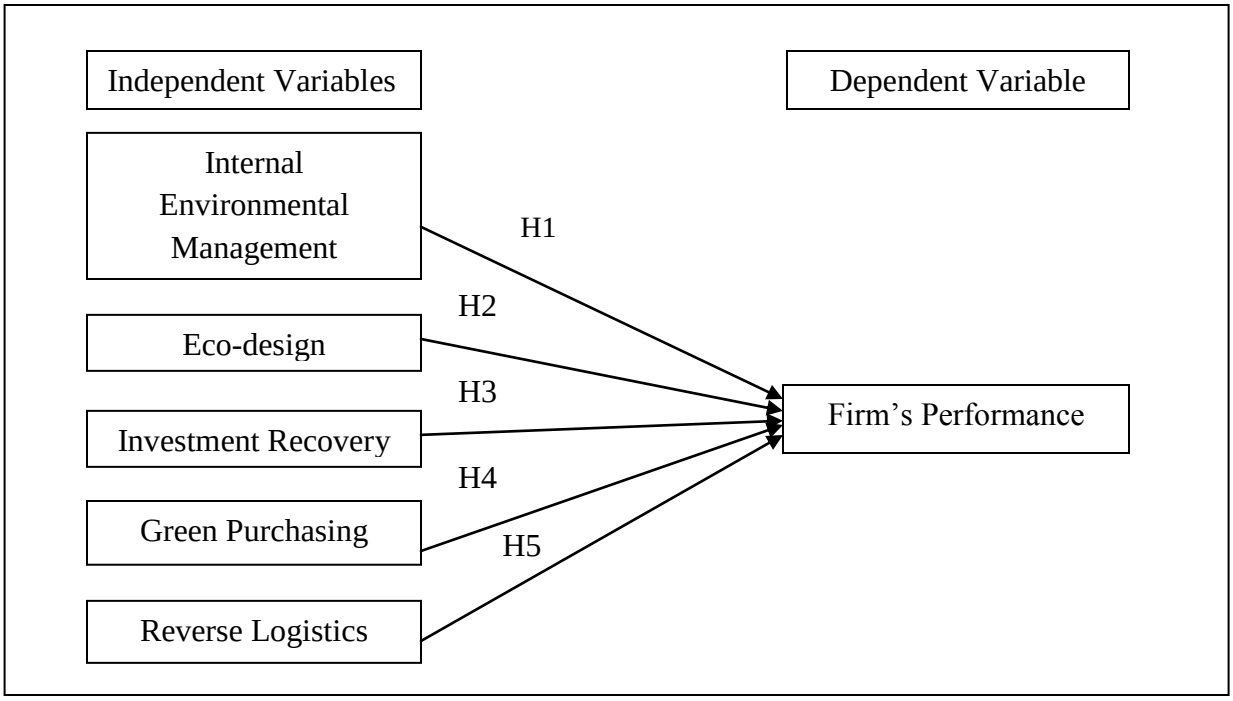
A remanufacturing process allowed used products to be collected and resold in market was one of the concepts embedded in product stewardship. Thus, according to Tibben-Lembke (2002), Reverse Logistics (RL) in terms of the product life extension can directly affect organizational performance (Murphy & Poist, 2003).

2.2.4.3 Sustainable Development

The relationship between the firm and their stakeholders will be translated into material investments and long-run commitment to the economic development (Markley & Davis, 2007). Therefore, sustainable development related to Investment Recovery (IR). With sustainable development strategy, it might achieve a firm's expectation for future performance that may reflect on the price earnings or market-to-book ratio (Hart, 1995) where it may affect the IR of a firm.

2.3 Proposed Conceptual Framework/ Research Model

Figure 2.1: Antecedents Affecting Organizational Performance



Adapted from: Rao & Holt, 2005; Zhu et al., 2005.

2.4 Hypotheses Development

Based on Kumar and Chandrakar (2012), 5 hypotheses were formulated in this study to explain the relationship between GSCM practices and organizational performance.

H1: There is a positive relationship between IEM and manufacturing organizational performance.

H2: There is a positive relationship between ED and manufacturing organizational performance.

H3: There is a positive relationship between IR and manufacturing organizational performance.

H4: There is a positive relationship between GP and manufacturing organizational performance.

H5: There is a positive relationship between RL and manufacturing organizational performance.

2.5 Conclusion

This chapter focused on reviewing past empirical studies to explain the relationship between GSCM practices and organizational performance. Subsequently, related theoretical model was examined to serve as foundation to develop a conceptual framework. Lastly, 5 hypotheses had been developed to provide directions of the relationships among variables. Chapter 2 served as a guideline to have better understanding towards the methodology of this study that will be further discussed in chapter 3.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

In chapter 3, an overview of the research methodology was explained through eight sections which included research design, data collection method, sampling design, research instrument, construct measurement, data processing and data analysis techniques. Subsequently, a summary of this chapter was provided.

3.1 Research Design

The aim of this study was to study the relationship between GSCM practices and performance of manufacturing organizations in Malaysia. This was a cross-sectional study because this study examined the relationship between GSCM practices that lead to improvement in Malaysian manufacturing firm's performance.

Mail questionnaire was used in data collection because it can cover broad geographical field in lesser time and lower cost (Sekaran, 2003; Eltayeb et al., 2011). Prior to this, the survey was pilot tested by 20 ISO14001 certified manufacturing firms before mailing the survey to validate and refine the measurement instrument and make some modifications on it (Zhu et al., 2008a). Data analysis techniques used were descriptive statistics and inferential analysis, namely Pearson Correlation Analysis, correlation coefficient, Multiple Linear Regressions (MLR).

3.2 Data Collection Method

3.2.1 Primary Data

In this research, primary data was collected. The method of data collection used was self-administered questionnaires because data was standardized and easy to make comparison (Saunders, Lewis, & Thornhill, 2009). 329 survey forms were sent to the purchasing managers in certified manufacturing firms by using mail questionnaire in this study. The modified Dillman's Total Design Method (TDM) was a procedure that included a personalized cover letter, a questionnaire and a follow-up mailing to send to the targeted respondents. By using this Dillman's TDM, it was able to produce a higher response rate (Anema & Brown, 1995; De Leeuw & Hox, 1988).

3.2.2 Secondary Data

Besides, secondary data is useful to compare with primary data to evaluate how representative these data were of the population (Saunders et al., 2009). In this study, secondary data was collected from external databases such as ScienceDirect, Emerald, SpringerLink, EBSCOhost, ProQuest and other databases which can be found in UTAR library website – libezp.utar.edu.my. Besides, internet search engine such as Google Scholar was used to gather related material and literature as well.

3.3 Sampling Design

The unit of analysis was ISO 14001 certified manufacturing organizations as they were most probably to have initiative on adoption of GSCM practices (Darnall, Jolley, & Handfield, 2006; Eltayeb & Zailani, 2009; Sroufe, 2003; Zhu et al., 2008a). The population consisted of all ISO 14001 certified manufacturing firms in Malaysia. Federation of Malaysia Manufacturers (FMM) was the largest private sector economic organization in Malaysia, consisting of 2500 manufacturing and service companies of different sizes (FMM, 2009). The sampling frame was obtained from 40th FMM Directory 2009 of Malaysian Industries. There were 329 ISO 14001 certified manufacturing firms in Malaysia (FMM, 2009). Census method was used to collect data due to the small sampling frame available and possibility of low responses received when collecting feedback (Eltayeb et al., 2010).

Questionnaires were addressed to purchasing manager of targeted firms. The reason why purchasing managers were chosen was due to the fact that this research was about SCM and they were in an important place to determine the environmental footprint of a company (Walton, Handfield & Melnyk, 1998).

The surveys for this study were mailed to 329 of ISO 14001 certified manufacturing firms. Out of these 329 questionnaires, 131 questionnaires were rejected because of no response/partial response/missing data, hence giving a total response rate of 60.18%. Sample size should be an item-to-response ratio from 1:4 to 1:10 for each set scales to be examined. There were 44 items to be measured in this study, thus the sample size from 176 to 440 respondents would be sufficient for research analysis (Hinkin, 1995).

3.4 Research Instrument

Questionnaire was used in this study as a means to collect data. According to Saunders et al. (2009), questionnaire was a pre-determined same set of questions that each person was asked to respond.

3.4.1 Instruments and Procedures Used

To increase the feedback and respond rate from target respondent, modified Dillman's Total Design Method (TDM) was applied while designing the survey questionnaire. There were few steps to be carried out in the TDM. First, it was required to include the cover letter of survey questionnaire to explain the purpose of the survey and the categories of respondent. Besides, confidentiality was included in the cover letter to safeguard the respondent's interest. Second, return envelopes were provided for the convenient of respondents in returning the surveys. Third, follow-up telephone call was a necessary step to remind those companies that have not response for a week. Other than TDM, five-point Likert scale was used in constructing the questionnaire because it assisted respondents to complete the survey in lesser time.

3.4.2 Pilot Studies

As cited in Thabene, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., Robson, R., Thabene, M., Giangregorio, L., and Goldsmith, C. H. (2010), the Concise Oxford Thesaurus defined a pilot study as an experimental, exploratory, pre-test, preliminary, trial or try out investigation.

The main purpose of conducting pilot test in this study was to test the normality and reliability of data, identify design flaws of the questionnaires and prevent issues such as duplicate item being asked in questionnaires (Beebe, 2007). 20 sets of questionnaires were sent and addressed to purchasing manager of the firm. The 20 respondents were randomly chosen from FMM which consisted of 329 ISO 14001 certified manufacturing firms in Malaysia (FMM, 2009). After collecting back the questionnaires, normality test and reliability test were carried out to check the normality, validity and reliability of the data.

3.5 Constructs Measurement

GSCM practices were examined based on 5 dimensions of GSCM initiatives which included IEM, ED, IR, GP and RL (Eltayeb & Zailani, 2009; Menzel, Smagin, & David, 2010; Zhu & Sarkis, 2004; Zhu et al., 2005). The linkages of each dimension of GSCM practices and organizaitional performance were being examined based on economic, environmental and operational performance. An empirical, survey-based research approach was adopted, comprising of a total of 44 items regarding to GSCM practices (IVs) and organizational performance (DV) as described in Appendix B.

The questionnaire contained 25 items to test on GSCM practices (IVs) based on previous studies (Eltayeb & Zailani, 2009; Lin, 2011; Zhu & Sarkis, 2004). The study used a five-point Likert scale for all dimensions of green supply chain practices ranging from 1= not considering it to 5= implementing successfully.

19 questions to examine organizational performance (DV) on implementation of GSCM practices were adapted from Rao and Holt (2005), and Zhu and Sarkis (2004). Questions about organizational performance such as environmental, economic and operational performance by implementing GSCM practices were answered using a five-point Likert scale ranging from 1= not at all to 5= significant.

3.6 Data Processing

Before analyzing the data collected, some procedures need to be performed to ensure the data collected were reliable and valid. Data processing included data checking, data editing, data coding and data transcribing.

3.6.1 Data Checking

Data checking was a process of ensuring the data collected were complete and usable for our analysis by making sure the respondent of questionnaires was our target respondent and all questions were answered in a questionnaire (Saunder et al., 2009).

3.6.2 Data Editing

Data editing was to exclude all incomplete or fault questionnaire that cannot be used in analysis. The incomplete questionnaires were either disregarded or allocated with the missing values (Saunder et al., 2009). In this research, out of 209 questionnaires collected back (excluding non-

response), there were 11 incomplete questionnaires and are extracted out, so left with 198 useable questionnaires.

3.6.3 Data Coding

Data coding was a systematic process of condensing a large data sets into smaller units via the formation of categories and concepts deduced from the data (Saunder et al., 2009). In this research, the data were coded accordingly before the descriptive data are entered into SAS for further analysis. For example, the independent variable 'Internal Environmental Management' had been decoded into 'IEM' before transcribing the collected data into SAS.

3.6.4 Data Transcribing

Data transcription was a process of data entry where the collected data was keyed. It involved transferring the coded data from survey into the computer by punching the keys on keyboard (Saunder et al., 2009).

3.6.5 Data Cleaning

A process to check the correctness of data input (Saunder et al., 2009).

3.7 Data Analysis

According to Scarisbrick-Hauser (2007), the objective of data analysis was to analyze data, interpret and integrate the result into the context of business decision-making. The compiled data analyzed using Statistical Analysis System (SAS).

3.7.1 Descriptive Statistics

Descriptive statistics was basic descriptive measures that summarizing data by displaying some numeral measures of where the center of the data set were and how the other values vary from that center (Janes, 1999). Descriptive statistics that were used in this study consisted of mean, standard deviation, frequency, percentage (Eltayeb et al., 2011).

3.7.2 Scale Measurement

3.7.2.1 Normality Test

It is important that normality assumption was satisfied when conducting parametric tests (Drezner, Turel, & Zerom, 2010). Skewness and kurtosis were used in this study to test the normality of results. The rule of thumb said that a variable was normally distributed if its skewness and kurtosis had values between -2.0 and +2.0 (Gujarati & Porter, 2009).

3.7.2.2 Reliability Test

Cronbach's Alpha was used to test the data reliability. Cronbach's alpha ranged from 0 to 1.00, with values close to 1.00 indicated a high reliability. It was recommended to have a reliability coefficient of 0.70 or higher (Saunders et al., 2009).

3.7.3 Inferential Statistic

Pearson Correlation Analysis and Multiple Linear Regressions were utilized in this study since the DV consisted of interval data, so a parametric test was conducted.

3.7.3.1 Pearson Correlation Analysis

Pearson Correlation Analysis was utilized in this research to measure the strength of a linear relationship between two variables (Saunders et al., 2009). Multicollinearity problem was tested through correlation matrix. When correlation coefficient between two variables exceeded 0.8, multicollinearity problem appeared (Field, 2005).

3.7.3.2 Multiple Linear Regressions (MLR)

MLR was used to calculate multiple regression coefficients and regression equation using at least two IVs to show the strength of

the association of the GSCM practices and organizational performance (Saunders et al., 2009). As the research consisted of five independent variables such as IEM, ED, IR, GP and RL, MLR was used to determine which independent variable influenced the organizational performance (Eltayeb et al., 2010). The equation of MLR which showed the relationship of the antecedents with GSCM practices was as below:

The equation for the research will be as below:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \, c \, X_5$

Whereby,

Y = Dependent variable

X = Independent variables

α = Constant Coefficient

$\beta_1 .... \beta_5$ = Regression Coefficient for $X_1 .... X_5$

For this study, the equation was as below:

Organizational Performance = α + β_1 (Internal Environmental Management) + β_2 (Eco-design) + β_3 (Investment Recovery) + β_4 (Green Purchasing) + β_5 (Reverse Logistics)

3.8 Conclusion

This chapter highlighted the methodologies conducted in this study. It also explained the research design, data collection method which consisted of primary and secondary data, sampling design, constructs measurement, data processing description and the techniques used in data analysis. The following chapter will illustrate the results by presenting them in tables form for better understanding.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter presented results from questionnaires that had been distributed by using Statistical Analysis System (SAS). SAS was being used to conduct descriptive analysis of the demographic profile of the respondents as well as the central tendencies measurement of constructs, reliability test, normality test, Pearson correlation and Multi Linear Regression (MLR).

4.1 Pilot Test

Measures for each variable were tested for reliability and normality through the pre-testing of questionnaire among 20 Purchasing Managers in selected ISO 14001 certified manufacturing firms. Table 4.01 illustrated the reliability test of 20 questionnaires for pilot testing.

Table 4.1: Normality Test on Pilot Test

Variables	Item	Skewness	Kurtosis
Internal	IEM 1	-1.0187	0.1044
Environmental	IEM 2	-0.6465	1.3213
Management	IEM 3	-0.8159	1.6817
	IEM 4	-0.4146	1.4464
	IEM 5	-1.1176	0.7059
	IEM 6	-0.5025	-0.1966

Eco-Design	ED 1	-0.2487	-0.9993
	ED 2	-0.0967	0.1892
	ED 3	-0.6808	0.9840
Investment	IR 1	-0.3155	-1.6675
Recovery	IR 2	0.2500	-0.3371
	IR 3	0.5305	0.4902
Green	GP 1	-0.7629	0.1396
Purchasing	GP 2	0.0000	-0.6706
	GP 3	0.3192	-0.6974
	GP 4	0.1167	-0.2123
Reverse	RL1	-0.7709	0.3545
Logistics	RL2	-0.2916	-0.7342
	RL3	0.2565	-1.0428
	RL4	0.7218	0.5342
	RL5	-0.7126	0.1540
	RL6	-0.5586	0.1765
	RL7	0.7365	0.5737
	RL8	-0.3945	-0.4663
	RL9	-1.2398	0.5229
Organizational	EP1	-0.9494	1.1837
Performance	EP2	-0.3766	1.2084
	EP3	-0.0872	1.5217
	EP4	-0.7972	1.7324
	EP5	-0.7283	0.6354
	EP6	-1.2438	1.4464
	PE1	-0.3055	-0.8902
	PE2	-0.1768	-0.9314

	PE3	-0.0800	-0.8928
	PE4	-0.3997	-0.6960
	PE5	0.1265	-1.0267
	NE1	-0.1013	-0.7983
	NE2	0.0355	0.4119
	NE3	-0.2255	-0.0182
	NE4	0.1939	-0.3566
	CP1	-0.4236	-0.1049
	CP2	-0.1939	-0.3566
	CP3	0.5492	-0.5481
	CP4	-0.1516	-0.8798

Source: Developed for the research

Statistically the rule of thumb said that a variable was normally distributed if its skewness and kurtosis had values between -2.0 and +2.0 (Gujarati & Porter, 2009). Based on the table above, it appeared that the values of skewness and kurtosis were between -2.0 and +2.0. Thus, it was assumed that the pilot test result was normally distributed.

Table 4.2: Reliability Test on Pilot Test

Variables	Number of Items	Cronbach's Alpha
Internal Environmental Management	6	0.8642
Eco-Design	3	0.7247
Investment Recovery	3	0.7765
Green Purchasing	4	0.8625
Reverse Logistics	9	0.8615
Organizational Performance	19	0.7317

Source: Developed for the research

It appeared from the table above that the reliability coefficients of all IVs and DV ranged between 0.70 and 0.90, well exceeded the limit of 0.70. Hence, it can be summarized that the constructs met the acceptable level of reliability (Nunnally, 1978) to check the constructs' internal consistency and validity.

4.2 Descriptive Analysis

4.2.1 Demographic Profile of the Respondents

Table 4.03 showed the statistic results on age of the organization, organization's main activity, number of employees, ownership, duration of establishment of GSCM in organization and the job position of the respondents.

Table 4.3: Demographic Profile of the Respondents

Variables	Frequency	Percentage
Age of the firm:		
≤ 10 years old	104	52.53
≥ 10 years old	94	47.47
Company's main activity		
Food product and beverages	49	24.75
Computer and electric products	38	19.19
Electric products	47	23.74
Chemical, rubber and plastic products	30	15.15
Machinery	23	11.62
Construction	11	5.56

Number of employees		
≤50	87	43.94
51 – 200	80	40.4
201 or above	31	15.66
Ownership		
State-owned	26	13.13
Foreign direct investment or joint venture	53	26.77
Private	107	54.04
Other	12	6.06
Duration of establishment of GSCM in organization		
1 year	90	45.45
2 year	46	23.23
3 Years	34	17.17
More than 3 years	28	14.14
Job position of respondents		
Executive	29	14.65
Manager/Head of Department	135	68.18
General Manager/CEO/Director	34	17.17

Source: Developed for the research

Among all the respondents, majority of the respondents' age of firms were less than 10 years, which comprised of 104 (53%) respondents. The remaining 94 (47%) were more than 10 years. Majority of the respondents' main activity of firms were food products and beverages, which comprised of 49 (25%) respondents. Most of the firms' number of employees were less than 50 (44%), followed by 51 – 200 (40%) and 201 or above (16%). Majority of the ownership of firms were private, which comprised of 107 (54%).

Most of the firms' duration of establishment of GSCM was 1 year only, which comprised of 90 (45%) respondents. Majority of the job position of respondents were Manager/Head of Department (68%), followed by General Manager/CEO/Director (17%) and Executive (15%).

4.2.2 Central Tendencies Measurement of Constructs

Table 4.4: Descriptive Statistics (n=198)

Variables	Item	Mean	Std. Deviation
Internal Environmental Management	IEM 1	3.5606	1.0682
	IEM 2	3.4546	0.9535
	IEM 3	3.4697	0.9271
	IEM 4	3.4950	0.9598
	IEM 5	3.4849	0.9858
	IEM 6	3.3434	0.9786
Eco-Design	ED 1	3.5000	0.9330
	ED 2	3.4697	0.9325
	ED 3	3.4950	0.9385
Investment Recovery	IR 1	3.2980	1.0211
	IR 2	3.2929	1.0300
	IR 3	3.2172	0.9812
Green Purchasing	GP 1	3.4192	0.8905
	GP 2	3.2727	0.9432
	GP 3	3.3838	0.9474
	GP 4	3.3333	0.9290
Reverse Logistics	RL1	3.2525	0.8708
	RL2	3.3434	0.8569

	RL3	3.2424	0.9462
	RL4	3.2576	0.9869
	RL5	3.2626	1.0085
	RL6	3.2778	0.9391
	RL7	3.4343	0.8745
	RL8	3.4748	0.9051
	RL9	3.4596	0.9851
Organizational Performance	EP1	3.4141	0.8551
	EP2	3.4495	0.9532
	EP3	3.4748	0.9595
	EP4	3.4293	0.9572
	EP5	3.5455	0.9154
	EP6	3.5556	1.0098
	PE1	3.3939	1.0158
	PE2	3.3939	0.9593
	PE3	3.4242	0.9778
	PE4	3.3838	1.0540
	PE5	3.4444	0.9529
	NE1	3.0303	1.1528
	NE2	2.9697	1.1306
	NE3	3.0960	1.1470
	NE4	2.9849	1.1196
	CP1	3.5202	0.9328
	CP2	3.5808	0.8615
	CP3	3.5707	0.9027
	CP4	3.6010	0.9384

Source: Developed for the research

The table revealed that the highest mean among the six variables was CP4 by getting 3.6010 where majority agree or neutral regarding the item. The lowest mean was NE2 with 2.9697 which explained the opinion given to the item is neutral. Besides, NE1 had the highest standard deviation among all the items which indicated different range of opinion. However, EP1 had the lowest standard deviation among the variables.

4.3 Scale Measurement

4.3.1 Normality Test

Table 4.5: Normality Test

Variables	Item	Skewness	Kurtosis
Internal Environmental Management	IEM 1	-0.2353	-0.9038
	IEM 2	-0.0640	-0.6325
	IEM 3	-0.1809	-0.3540
	IEM 4	-0.2986	-0.3500
	IEM 5	-0.2625	-0.4968
	IEM 6	-0.3414	-0.2074
Eco-Design	ED 1	-0.2083	-0.3576
	ED 2	-0.3852	-0.2434
	ED 3	-0.3575	-0.0695
Investment Recovery	IR 1	-0.2209	-0.3959
	IR 2	-0.3034	-0.4210
	IR 3	-0.2855	-0.4120

Green Purchasing	GP 1	-0.1019	-0.3852
	GP 2	-0.0209	-0.3065
	GP 3	-0.1858	-0.4176
	GP 4	-0.2900	-0.1463
Reverse Logistics	RL1	-0.2357	-0.2910
	RL2	-0.2368	-0.4177
	RL3	-0.3214	-0.0910
	RL4	-0.2809	-0.3209
	RL5	-0.3972	0.0383
	RL6	-0.3221	-0.2388
	RL7	-0.0500	-0.2742
	RL8	-0.2976	-0.0561
	RL9	-0.3208	-0.2688
Organizational Performance	EP1	-0.2216	0.4455
	EP2	-0.3692	0.0601
	EP3	-0.4499	0.0520
	EP4	-0.3575	-0.0067
	EP5	-0.3361	-0.2037
	EP6	-0.3026	-0.1769
	PE1	-0.3539	-0.2252
	PE2	-0.3389	0.0587
	PE3	-0.3776	0.1078
	PE4	-0.3468	-0.4853
	PE5	-0.2128	-0.6722
	NE1	0.0408	-0.8210
	NE2	0.0387	-0.5868
	NE3	-0.0876	-0.7830
	NE4	-0.0138	-0.7071

	CP1	-0.4194	0.1768
	CP2	-0.3252	0.1531
	CP3	-0.2553	0.0590
	CP4	-0.3895	-0.0898

Source: Developed for the research

Based on Table 4.05, result from 198 respondents showed value between -2.0 and +2.0. Thus, normality of the standardized residual was assumed.

4.3.2 Reliability Test

Cronbach's Alpha was used for reliability test on 44 items in measuring six constructs. According to the rule of thumb, the Cronbach's Alpha which had exceeded 0.7 considered reliable and good.

Table 4.6: Reliability Test

Variables	Number of Items	Cronbach's Alpha
Internal Environmental Management (IEM)	6	0.8610
Eco-Design (ED)	3	0.7091
Investment Recovery (IR)	3	0.8350
Green Purchasing (GP)	4	0.7052
Reverse Logistics (RL)	9	0.8990
Organizational Performance (OP)	19	0.9046

Source: Developed for the research

Table 4.06 showed OP had the highest reliability with Cronbach's Alpha value of 0.9046, followed by RL, IEM, IR, ED and GP with Cronbach's Alpha value of 0.8990, 0.8610, 0.8350, 0.7091 and 0.7052 respectively. In comparison, there was a moderate range of 0.1994 between the highest and the lowest Cronbach's Alpha value. Generally, all variables were considered reliable as the Cronbach's Alpha of each variable had exceeded 0.7.

4.4 Inferential Analysis

4.4.1 Pearson Correlation Coefficient Analysis

Table 4.7: Correlation Matrix for Organizational Performance (OP)

		IEM	ED	IR	GP	RL	OP
IEM	Pearson Correlation						
	Sig.						
ED	Pearson Correlation	0.6946					
	Sig.	<.0001					
IR	Pearson Correlation	0.6205	0.6100				
	Sig.	<.0001	<.0001				
GP	Pearson Correlation	0.6614	0.5738	0.5594			
	Sig.	<.0001	<.0001	<.0001			

RL	Pearson Correlation	0.6586	0.5970	0.5734	0.6218		
	Sig.	<.0001	<.0001	<.0001	<.0001		
OP	Pearson Correlation	0.6055	0.5557	0.5475	0.5583	0.5789	
	Sig.	<.0001	<.0001	<.0001	<.0001	<.0001	

Source: Developed for the research

Note: IEM=Internal Environmental Management, ED=Eco-Design, IR=Investment Recovery, GP=Green Purchasing, RL=Reverse Logistics, OP=Organizational Performance

According to Toh, Marthandan, Yee, Ooi, and Arumugam (2009), correlation coefficient should not be more than 0.80 to avoid multicollinearity problem (Field, 2005). Since the highest correlation coefficient was 0.6946, which was less than 0.8, there was no multicollinearity problem in this study.

Based on the above table, all the associated pairs of variables were found to be statistically significance at the level of p<.0001. The analysis result implied that IEM (r=0.6055, p=<.0001), ED (r=0.5557, p=<.0001), IR (r=0.5475, p=<.0001), GP (r=0.5583, p=<.0001) and RL (r=0.5789, p=<.0001) were correlated to organizational performance. The correlation between IEM and ED is the strongest (r=0.6946, p=<.0001), followed by the relationship between IEM and GP (r=0.6614, p=<.0001).

In conclusion, this study supported all the hypothesized assumptions indicating there was a significant relationship between OP and IEM, ED, IR, GP and RL.

H_1: There is a significant relationship between Internal Environmental Management and Organizational Performance.
H_2: There is a significant relationship between Eco-Design and Organizational Performance.
H_3: There is a significant relationship between Investment Recovery and Organizational Performance.
H_4: There is a significant relationship between Green Purchasing and Organizational Performance.
H_5: There is a significant relationship between Reverse Logistics and Organizational Performance.

4.4.2 Multiple Linear Regressions (MLR)

Table 4.8: Model Summary

Model	R Square (R^2)	Adjusted R Square
1	0.4684	0.4545

Source: Developed for the research

The coefficient of determination R^2 is 45.45%. Thus, the GSCM practices can significantly account for 45.45% in the organizational performance.

Table 4.9: Analysis of Variance

Source	Analysis of variance	
	F Value	Pr > F
Model	33.83	<.0001

Source: Developed for the research

The F-statistics produced (F value = 33.83) was significant at 1% level (Sig. F = <.0001), thus confirming the fitness for the model. Therefore, there was a statistically significant relationship between the GSCM practices and the organizational performance.

Table 4.10: Coefficients

Parameter Estimates				
Variable	Parameter Estimate	Pr > |t|	Tolerance	Variance Inflation
Intercept	1.1298	<.0001	.	0.0000
Internal Environmental Management (IEM)	0.1582	0.0240	0.3671	2.7238
Eco-Design (ED)	0.0988	0.1241	0.4451	2.2467
Investment Recovery (IR)	0.1069	0.0350	0.5159	1.9384
Green Purchasing (GP)	0.1342	0.0486	0.4809	2.0794
Reverse Logistics (RL)	0.1680	0.0126	0.4702	2.1268

Source: Developed for the research

Based on the Table 4.10, the least square prediction will be as below:-

OP = 1.1298 + 0.1582 (IEM) + 0.0988 (ED) + 0.1069 (IR) + 0.1342 (GP) + 0.1680 (RL)

In order to test for multicollinearity problem among variables, variance inflation factor (VIF) and tolerance were applied. The multicollinearity statistics showed that the tolerance indicator for IEM, ED, IR, GP and RL were greater than 0.1, and their VIF values were less than 10. The result

indicated that no multicollinearity problem had occurred (Ott & Longnecker, 2001).

The results showed that IEM (p=0.0240), IR (p=0.0350), GP (p=0.0486) and RL (p=0.0126) significantly affected the organizational performance of the firms. Based on Table 4.10, it indicated that the most important GSCM practices that affected the organizational performance were RL and IEM, followed by IR and GP. However, ED was found to be not significantly related to organizational performance.

4.5 Conclusion

This chapter summarized and interpreted the output of SAS data collected from the survey. The major results, findings and interpretations will be used in next chapter for discussion, implications and conclusion of the overall research. Recommendations for future research on the limitation would also be included in Chapter 5.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.0 Introduction

In chapter 5, it provided a summary of statistical analyses that had been presented in previous chapter. Subsequently, major findings of study, implications and limitations were discussed. Recommendations for future researchers and conclusion were drawn at the end of this chapter.

5.1 Summary of Statistical Analysis

198 sets of questionnaires were analyzed for further study and summarized based on the statistical results in chapter 4. The analysis used included descriptive analysis, reliability test, normality test, Pearson Correlation Coefficient Analysis and Multiple Linear Regressions (MLR).

5.1.1 Descriptive Analysis

Based on the result, 104 of the respondents' age of firms were less than 10 years and 94 were more than 10 years. Majority of respondents' were from foods and beverage industry, which consists of 49 respondents, following by 47 electric industry, 38 computer and electric industry, 30 chemical, rubber and plastic industry, 23 machinery industry and 11 construction industry. Besides, 87 firms having equal or less than 50 employees, 80

firms having 51-200 employees and 31 firms having 201 or more employees. Furthermore, majority of the ownership of the firms were private, which comprised of 107 firms, following by 53 foreign direct investment or joint venture, 26 state-owned, and 12 other ownership. Moreover, 90 of the firms established GSCM practices for one year, 46 firms established it for 2 years, 34 firms established it for 3 years and 28 established it for more than 3 years. Most of the job position of the respondents was Manager/Head of Department, following by 34 General Manager/CEO/Director and 29 executive.

5.1.2 Scale Measurement

Skewness and kurtosis had values between -2.0 and +2.0, the result was normally distributed (Gujarati & Porter, 2009).

Table 5.1: Reliability Test (n=198)

Variables	Number of Items	Cronbach's Alpha
Internal Environmental Management (IEM)	6	0.8610
Eco-Design (ED)	3	0.7091
Investment Recovery (IR)	3	0.8350
Green Purchasing (GP)	4	0.7052
Reverse Logistics (RL)	9	0.8990
Organizational Performance (OP)	19	0.9046

Source: Developed for the research

The above table showed OP had the highest reliability with Cronbach's Alpha value of 0.9046, following by RL, IEM, IR, ED and GP with

Cronbach's Alpha value of 0.8990, 0.8610, 0.8350, 0.7091 and 0.7052 respectively. Generally, all variables were deemed to be reliable as the Cronbach's Alpha of each variable had exceeded 0.70 (Nunnally, 1978).

5.1.3 Inferential Analysis

Table 5.2: Pearson Correlation Coefficient Analysis (n=198)

		IEM	ED	IR	GP	RL	OP
IEM	Pearson Correlation						
	Sig.						
ED	Pearson Correlation	0.6946					
	Sig.	<.0001					
IR	Pearson Correlation	0.6205	0.6100				
	Sig.	<.0001	<.0001				
GP	Pearson Correlation	0.6614	0.5738	0.5594			
	Sig.	<.0001	<.0001	<.0001			
RL	Pearson Correlation	0.6586	0.5970	0.5734	0.6218		
	Sig.	<.0001	<.0001	<.0001	<.0001		
OP	Pearson Correlation	0.6055	0.5557	0.5475	0.5583	0.5789	
	Sig.	<.0001	<.0001	<.0001	<.0001	<.0001	

Source: Developed for the research

Table 5.02 showed that p-value of all the associated pairs of variables were <.0001, which indicated that all the IVs were moderately and positively correlated to Organizational Performance. Besides, all the correlation coefficients were below 0.80, which indicated that there was no multicollinearity problem. Therefore, all the hypotheses were supported.

Table 5.3: Multiple Linear Regression

	Parameter Estimate	Pr > |t|
Intercept	1.1298	<.0001
Internal Environmental Management (IEM)	0.1582	0.0240
Eco-Design (ED)	0.0988	0.1241
Investment Recovery (IR)	0.1069	0.0350
Green Purchasing (GP)	0.1342	0.0486
Reverse Logistics (RL)	0.1680	0.0126
R^2		0.4684
Adjusted R^2		0.4545
F		33.83
Sig.		<.0001

The result showed that the IVs had significant relationship with Organizational Performance since the coefficient of IEM, IR, GP and RL were 0.0240, 0.0350, 0.0486 and 0.0126 respectively, except ED (p=0.1241) which had coefficient of less than 0.05, had no significant relationship with Organizational Performance.

The formula of MLR is as below:

OP = 1.1298 + 0.1582 (IEM) + 0.0988 (ED) + 0.1069 (IR) + 0.1342 (GP) + 0.1680 (RL)

RL had the greatest influence on OP as it had the greatest predicting power (Parameter Estimate=0.1680). Overall, 45.45% of the variation of Organizational Performance can be explained by all the IVs.

5.2 Discussions of Major Findings

5.2.1 Internal Environment Management (IEM)

Based on the Multiple Linear Regression (MLR) results, IEM exhibited a significant relationship with organizational performance (p-value = 0.0240 which is <0.05). Hence, the hypothesis in this research was supported. There was a positive relationship between IEM and organizational performance

Our result was consistent with prior researchers that found out proactive environmental management can improve environmental performance, competitive advantage and economic performance (Lopez-Gamero, Molina-Azorin, & Claver-Cortes, 2011), and with the encouragement from superiors, a firm was more likely to pursue Proactive Environmental Strategy which in turn boast sales and profit growth (Menguc, Auh, & Ozanne, 2010). Besides, since environmental auditing program was part of IEM (Zhu et al., 2010), it was found that internal auditors in manufacturing sector had better environmental knowledge than those in

service sector to improve sustainable development of organization (Shih, Chen, & Chen, 2006).

It can be inferred that top management's commitment was important to help ensure the progress of implementation of GSCM. This was because based on the mean result, it can be seen that commitment from senior managers (IEM1: mean=3.5606) was more important than commitment from mid-level managers (IEM2: mean=3.4546). Besides, cross-functional cooperation for environmental improvements (IEM3: mean=3.4697) indicated that it was important to have communication across departments to encourage teamwork in an organization. Furthermore, total quality environment management (IEM4: mean=3.4950), environmental compliance and auditing programs (IEM5: mean=3.4849) and environmental management system exist (IEM6: mean=3.3434) suggested that good communication between environmental professionals that came with management support and managers was crucial for environmental management.

5.2.2 Eco-Design (ED)

The result of p-value for ED was 0.1241 based on the MLR results (p-value = 0.1241 which is >0.05). The hypothesis in this study was not supported. There was a negative relationship between ED and organizational performance.

Our result was contradicted with prior researchers that found out ED had direct influence on the firm's internal performance (Elthayeb, Zailani, & Ramayah, 2011). However, it was consistent with Zhu, Sarkis, & Laim

(2013), which stated that ED had no direct relationship with organizational performance. Based on this research, the finding showed that ED might affect organizational performance through GP and customer with corporation (CC), but CC had not been included in our research model.

It was surprising that ED was found to be not significant in improving organizational performance even though the mean value for each item tested for ED was on average of 3.46. It was possible that many tools for ED failed to improve organizational performance because they sought retrospective analysis based on existing products instead of focusing on design (Lofthouse, 2006). ED as a process must be incorporated into the design and management processes of organization (Pochat et al., 2007).

5.2.3 Investment Recovery (IR)

The MLR's result showed a positive relationship between IR and organizational performance with the p-value 0.0350, which was <0.05. In other words, H3 was supported and there was a significant relationship between IR and organizational performance.

Our result was in line with past studies of Rogers, Rogers, and Lembke (2010), which proved that IR could improve company's environmental and economic performance by recapturing value of unwanted items and reducing landfill costs. Besides, Jacobs and Subramanian (2012) also revealed that IR could improve total supply chain profit and reduce environmental impacts. Moreover, Zhu, Sarkis, and Lai (2008c) stated that IR had significant environmental and economic benefits to organizations.

The result showed that the mean value on Investment recovery (sale) or excess inventories/materials (IR1: mean=3.2980) is slightly higher than sale of scrap and used materials (IR2: mean=3.2929) and sale of excess capital equipment (IR3: mean=3.2172). This may be due to the sale of excess inventories or materials can help to improve company's profit as well as reducing negative environmental impacts. Most of the companies prefer to sell excess inventories or materials because all the unused inventories or materials will be wasted and if dispose them in an inappropriate way would create environmental risks, such as penalty from the regulators. Sale of scrap and used materials was also important to improve organizational performance as disposal of hazardous waste would result in contamination of soil and waters. However, sale of excess capital equipment had the least mean value because machinery can become obsolete easily as technology changed rapidly.

5.2.4 Green Purchasing (GP)

According to the Multiple Linear Regression (MLR) result, it showed that the p-value for GP was 0.0486 which was less than the value of 0.05. This indicated that the H4 was supported. In other words, there was a significant relationship between GP and firm's organizational performance.

Result showed there was a positive relationship between environmental purchasing and firm's financial performance, this was consistent with the past empirical study of Carter et al. (2000). Since supplier was playing important role in procurement process of GSCM, suppliers were required to understand the GP and environmental regulations in order to achieve successful environmental performance, and thus building competitive advantages (Salam, 2001). Furthermore, Rao and Holt (2005) emphasized

about greening the supply chain (including GP) had positive influences on competitiveness and economic performance.

Cooperation with suppliers for environmental objectives have higher mean value (GP1: mean=3.4192) compared to the other three element in GP, this showed that most manager believed supplier played an important roles in supply chain. As cited in Hu and Hsu (2009), supply selection was critical to purchasing management because misappropriate supplier may lead to a disrupted supply chain (Hsu & Hu, 2010). Next, Suppliers' ISO 14000 certification also indicated a relatively large mean value (GP3: mean=3.3838). In other words, managers would choose suppliers that are capable to meet with the environmental standards to prevent from exposing firm to issue of environmental sustainability. Furthermore, environmental audit for suppliers internal management (GP2: mean=32727) and Second-tier supplier environmental friendly practice evaluation (GP4: mean=3.3333) showed that organizations that collaborated with suppliers on solving environmental problems may benefit from improved communications, system integration and less pollution control cost.

5.2.5 Reverse Logistic (RL)

There was a significant relationship between IR and organizational performance (p-value = 0.0126, which is <0.05) based on the MLR result. Therefore, null hypothesis was rejected while the hypothesis was supported and there was a positive relationship between IR and manufacturing organizational performance.

The result was consistent with the past researchers which indicated that the reverse logistics program was positively correlated with program effectiveness which included service-oriented items and financial-oriented items (Daugherty, Autry, & Ellinger, 2001). Besides, with the implication of reverse logistics system it resulted in better customer loyalty and minimization of operational cost (Chan & Chan, 2008). Furthermore, transportation lag and supplier delay in processing returns had an important influence on viability of RL irrespective of return volumes which in turn affect the profitability of organizations (Tan & Kumar, 2006).

Based on the finding, manufacturing firms of the target respondents prefer to collect back the used packaging (RL2: mean=3.3434) and used products (RL1: mean=3.2525) from their customers than required the suppliers to collect back packaging materials (RL3: mean=3.2424) because it was more difficult to request suppliers to collaborate with us to collect back packaging materials when the suppliers did not adopt GSCM in their organizations. Besides, manufacturing firms encouraged their customers for safe refill (RL6: mean=3.2778) because if returning the used products (RL4: mean=3.2576) or packaging (RL5: mean=3.2626) to the suppliers to recycle, retain of materials and remanufacture, the process will be more complicated and it may incur more costs. Besides, positively launching recycle system (RL7: mean=3.4343), setting internal material recycling system (RL9: mean=3.4596) and implementing recycle system and increasing profit (RL8: mean=3.4748) because it may create profitable business opportunities through recapturing otherwise lost value.

5.3 Implication

Recently, environmental issues became a major global issue. Organizations should take proactive steps through green supply chain to make sustainable development a reality (Eltayeb & Zailani, 2009). Hence, by using the derived results in analysis, the firm may focus on GSCM practices that have positive influence on organizational performance.

5.3.1 Theoretical Implications

This study provided several implications for scholars. First of all, this research was an extended model of past researchers (Hazen, Cegielski & Hanna, 2011). This research had incorporated RL and IEM, which was an essential part of green supply chain that yet to receive research attention in most of the past studies. Chinese manufacturer were at the initial stage of adoption of GSCM practices, however they put less concern on IR because of their waste management policy and insufficiency of recycling systems (Zhu & Sarkis, 2004).

Besides, it can be a useful source for foreign researchers that plan to conduct research on GSCM practices in Asian countries because this research is focused in Malaysia, thus it can assist them for multi-country comparison type of research.

5.3.2 Managerial Implications

Since RL was the most significant attributes among all IVs, manufacturing firms should start implementing recovery programs into the organization operation. It involved activities such as reformation, remanufacturing, recycling and reuse.

In addition, the result showed that IEM had positive influence on organizational performance. Commitment from top management was essential in carrying out the GSCM practices (Hu & Hsu, 2010). Thus, management can organize and conduct workshop and seminars in the field of GSCM to improve the skills and knowledge of employees.

Besides, the findings also reflected the importance of GP in improving organizational performance. As cited in Walton, Handfield and Melnyk (1998), purchasing managers were important in influencing supplier process (Hu & Hsu, 2010). Moreover, past studies of Hu and Hsu (2010) proposed that suppliers played a significant role in environmental performance and sustainability of a company. So, it was important to establish good relationship with organization's suppliers.

Furthermore, the positive relationship between IR suggested that sales of scrap and used materials had higher implementation levels. For instance, organization can gain revenue by selling excess assets. Besides, Zhu et al. (2008c) stated that more than 70% of every sales dollar generated by IR can be organization's profit.

However, ED was found to be insufficient to have positive influence on organizational performance. Even though ED had no direct relationship with economic performance but did played important role in emerging GSCM practice (Zhu, Sarkis & Lai, 2013). Hence, manufacturing firms

should conduct a series of training to increase their employees' knowledge on eco-design practices and management.

5.4 Limitations and Recommendations for future research

The main limitation in this research was the focus on small sample of organizations in Malaysia. The focus on ISO14001 certified manufacturing firm in Malaysia excluded those organizations without formal environmental management certification but may have well developed environmental programs. Hence, the findings cannot be generalized to all organizations in Malaysia. As cited in (Zhu et al., 2007a, b), large sample size assist comparison of the result between sectors (Eltayeb et al., 2010). Thus, future research should include a larger sample and this would allow detailed cross-sectorial comparisons too.

Another limitation was that this study was conducted in Malaysia and the consistency of the results with foreign countries had to be verified in future research. Thus, future research can focus on carrying out a multi-country comparison to test the relationship between GSCM practices and organizational performance as well as the influence of moderating factors such as countries' culture (Hu & Hsu, 2010; Rao & Holt, 2005).

Besides, the mail questionnaires method that used in the data collection may be bias due to variety factors such as questionnaires may pass to different target respondents and they had limited understandings about GSCM. It would therefore be useful to include interviews, site visits and documents research to increase the research validity (Lee, 2009).

Furthermore, this study was a cross-sectional study, which measured the intention at a single point in times, future study can adopt a longer term of longitudinal study to promote a better understanding of sustainability trends (Wu, Dunn, & Forman, 2012).

5.5 Conclusion

Along with the rapid economic growth and business expansion, many countries were facing serious problem of deterioration of natural resources. Due to this, GSCM became increasingly important to implant into organization to change their operation models in all dimension. This paper explored the current status and relationship of GSCM practices and OP of ISO 14001 certified manufacturing firms in Malaysia.

Among the 5 antecedents sorted in this study, the empirical results showed that RL ($p=0.0126$) have a significant relationship with OP. Besides, IEM proved to have some significant relationship with OP (Salam, 2011; Rao & Holt, 2005; Carter et al., 2000; Zhu et al., 2008b; Jacobs & Subramanian, 2012; Rogers et al., 2010). On the other hand, the empirical results showed that ED ($p=0.1241$) had no direct relationship on organizational performance. However, ED was still encouraged to be included as part of GSCM. The initial stage on ED adoption may require high start-up investment which may lead to negative economic performance, but long term benefits are seen to be optimistic (Zhu et al., 2013).

Overall, this research was one of the few researchers to study GSCM practices in Malaysia. Hence, future researchers should put more attention in doing such research in developing countries such as Malaysia in order to provide more useful insight from both a practical and research perspective. And still, GSCM had plentiful space to be investigated in terms of research and practice.

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Appendix A

Summary of Past Empirical Studies on Green Supply Chain Management Practices and Organizational Performance

Study	Country	Data	Major Findings
Lopez-Gamero, Molina-Azorin, & Claver-Cortes, 2011	Swedish	Mail survey of environment manager of three-to-five star Spanish individual hotels	Proactive environmental management is positively related to the improved environmental performance, competitive advantage and financial performance. Managers' commitment to contribute to sustainable development is essential for business success.
Menguc, Auh, & Ozanne, 2010	New Zealand	Mail survey of 325 of manufacturing firms operating in variety of industries	Entrepreneurial orientation (i.e., innovativeness, proactive, risk-taking) has a positive influence on a Proactive Environment Strategy (PES) because a firm is not likely to pursue PES unless their superiors encourage it which in turn benefit sales and profit growth and thus, improve firm's performance.
Shih, Chen, & Chen, 2006	Taiwan	Mail survey of 240 companies in the higher-polluting manufacturing industry and 120 companies in the lower-pollution service industry	Internal auditors in the manufacturing industry have greater environmental knowledge than internal auditors in the service industry to realize strategic goal of sustainable development for the company.

Eltayeb, Zailani, & Ramayah, 2011	Malaysia	Mail survey to 551 EMS ISO 14001 certified manufacturing firm in Malaysia and 132 completed questionnaires were received.	GSCM practices have direct influence on the firm's performance outcome in which the influence of eco-design has a direct link to the firm's internal performance.
Zhu, Geng, Fujita, & Hashimoto, 2010	Japan	12 large Japanese manufacturers were contacted and 9 agreed to be involved in the research.	GSCM parctices (including eco-design) have significant effect to the environmental and financial performance improvement of manufacturing firms.
Zhu, Sarkis, Cordeiro, & Lai, 2008	China	Mailing and follow-up phone calls to 1000 randomly selected manufacturers of Dalian and 314 responded to the survey.	The adoption of GSCM practices, including eco-design, has significant effect on the environmental, economic and organizational performance of a firm.
Rogers, Rogers, & Lembke, 2010	USA	Dephi technique, industry trade publications US Department of Commerce data in North American Industry Classification System (NAICS) codes financial reports, news articles.	It is proved that secondary market could improve company's environmental and economic performance by recapturing value of unwanted items and reduce landfill costs.
Jacobs & Subramanian, 2012	USA	Two-echelon model that consist a supplier and a manufacturer to determine the impacts in integrated and decentralized supply chains.	IR could improve total supply chain profit and reduce environmental impacts.

Zhu, Sarkis, & Lai, 2008c	China	Pilot test, convenience surveys and a random survey of 314 surveys were collected from the respondents in power generating, chemical/petroleum, electrical/electronic and automobile industries.	IR has significant environmental and economic benefits to company even though it gains less attention in China.
Salam, 2011	Thailand	Primary data: 150 questionnaire are randomly sent to the certified ISO 14001 targeted companies listed in Benchmarks Electronics (Thailand) supplier and customer directory. Secondary data was derived from existing research, journals, case studies, and articles on the internet.	Product performance, purchase price, organizational environmental commitment and trading partners have a positive relationship with the adoption of green procurement for GSCM.
Rao & Holt, 2005	Philippines, United Arab Emirates	Survey questionnaire of comprising 64 items to ISO 14001 certified companies in South East Asia such as Philippines, Indonesia, Malaysia, Thailand and Singapore.	Greening the supply chain was significant to competitiveness and economic performance.
Carter, Kale, & Grimm, 2000	United States	Survey is sent to 1083 managers from consumer product manufacturing industries.	Result showed there is a positive relationship between environmental purchasing and firm performance

Daugherty, Autry, & Ellinger, 2001	United State	212 questionnaires being sent out to the retailers of selling electronics products by using self administered mail survey	RL program has both direct benefits (effective utilization of inventory) and indirect benefits (better corporate image and improved level of customer satisfaction) to the firm.
Chan & Chan, 2008	Hong Kong	The particular survey was done by mailed to 100 mobile phone companies and also follow-up interview 34 managers in the mobile phone industry	Proper implementation of reverse logistics system can result in better customer loyalty and lower operational cost.
Tan & Kumar, 2006	Singapore	Used data collected from a computer company manufacturer handling returns with volumes transacted over a period of two years	Transportation delay and supplier delay in processing returns have a significant impact on the viability of reverse logistics regardless of return volumes which in turn affect the profitability of company.

Appendix B: Operationalization of model variables

Variable	Item	Description	References	Measurement
Internal Environmental Management	IEM1	Commitment of GSCM from senior managers	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	IEM2	Support for GSCM from mid-level managers		
	IEM3	Cross-functional cooperation for environmental improvements		
	IEM4	Total quality environment management		
	IEM5	Environmental compliance and auditing programs		
	IEM6	Environmental management system exist		
Eco-Design	ED1	Design of products for reduced consumption of material/energy	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	ED2	Design of products for reuse, recycle, recovery of material, component parts		
	ED3	Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process.		
Investment Recovery	IR1	Investment recovery (sale) or excess inventories/materials	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	IR2	Sale of scrap and used materials		
	IR3	Sale of excess capital equipment		
Green Purchasing	GP1	Cooperation with suppliers for environmental objectives	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	GP2	Environmental audit for suppliers internal management		
	GP3	Suppliers' ISO 14000 certification		
	GP4	Second-tier supplier environmental friendly practice evaluation		
Reverse Logistics	RL1	Collects back used products from customers for recycling, reclamation of materials, or reuse	Carter and Ellram (1998)	5-points Likert Scale (Interval)
	RL2	Collects back used packaging from customers for reuse or recycling	Rogers and Tibben-Lembke (2001)	
	RL3	Requires suppliers to collect back their packaging materials	Carter and Ellram (1998)	
	RL4	Returns back its products to suppliers for recycling, retaining of materials, or remanufacturing	Rogers and Tibben-Lembke (2001	

	RL5	Returns back its packaging to suppliers for reuse or recycling	Rogers and Tibben-Lembke (2001	
	RL6	Returns back the products from customers for safe refill	Carter and Ellram (1998)	
	RL7	Positively launching recycle system	Lin (2011)	
	RL8	Setting internal material recycling system		
	RL9	Implementing recycle system and increasing profit		
Environmental	EP1	Environmental for air emission	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	EP2	Reduction of solid wastes		
	EP3	Reduction of waste water		
	EP4	Decrease of consumption for hazardous/harmful/toxic materials		
	EP5	Decrease of frequency for environmental accidents.		
	EP6	Improve an enterprise's environmental accidents		
Positive Economic	PE1	Decrease of cost for materials purchasing	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	PE2	Decrease of cost for energy consumption		
	PE3	Decrease of fee for waste treatment		
	PE4	Decrease of fee for waste discharge		
	PE5	Decrease of fine for environmental accidents		
Negative Economic	NE1	Increase of investment	Zhu and Sarkis (2004)	5-points Likert Scale (Interval)
	NE2	Increase of operational cost		
	NE3	Increase of training cost		
	NE4	Increase of cost of purchasing		
Competitiveness	CP1	Increased efficiency	Rao and Holt (2005)	5-points Likert Scale (Interval)
	CP2	Quality improvement		
	CP3	Productivity improvement		
	CP4	Cost saving		

Source:

Carter, C. R., & Ellrain, L. M. (1998). Reverse logistics: a review of the literature and framework for future investigation. *Journal of Business Logistics, 19*(1), 85-102.

Lin, R. (2011). Moderating effects of total quality environmental management on environmental performance. *African Journal of Business Management, 5*(20), 8088-8099.

Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations & Production Management, 25*(9), 898-916.

Rogers, D. S., & Tibben-Lembke, R. S. (2001). An Examination of Reverse Logistics Practices. *Journal of Business Logistics, 22*(2), 129–48.

Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management, 22*(3), 265-289.

Appendix C: Survey Questionnaires

The Relationship between Green Supply Chain Management Practices and Organizational Performance in Malaysia

Survey Questionnaire

The purpose of this survey is pertaining to your organization's Green Supply Chain Management **(GSCM)** adoption. Please answer all questions to the best of your knowledge. There are no wrong responses to any of these statements. All responses are completely confidential.

We seek respondents who have some knowledge in GSCM, not necessary must be working in the area of GSCM.

Thank you for your participation.

Instructions:

1) There are **THREE** (**3**) sections in this questionnaire. Please answer ALL questions in ALL sections.

2) This will only take you approximately 20 to30 minutes.

3) Please feel free to share your comment in the space provided. The contents of this questionnaire will be kept **strictly confidential**.

Section A: Company's Profile

In this section, we are interested in your background in brief. Please tick your answer and your answers will be kept strictly confidential.

QA1: Age of the firm:

- ❑ ≤ 10 Years Old
- ❑ > 10 Years Old

QA2: What is your company's main activity?

- ❑ Food product and beverages
- ❑ Computer and electric products and components
- ❑ Electric products (e.g. electric machines, fridges, and other electronic products
- ❑ Chemical, rubber and plastic products
- ❑ Machinery
- ❑ Construction
- ❑ Service
- ❑ Other, please specify _____

QA3: Number of employees in your organization:

❑ ≤ 50 ❑ 51- 200 ❑ 201 or above

QA4: Ownership:

❑ State-owned ❑ Foreign direct investment or joint venture

❑ Private ❑ Other

QA5: How long has your organization established Green Supply Chain Management?

❑ Considering it currently ❑ It has been 1 year

❑ It has been 2 years ❑ 3 Years

❑ It has been more than 3 years

QA6: Your job position:

❑ Executive

❑ Manager/Head of Department

❑ General Manager/CEO/Director

❑ Other (please specify):

_____

Section B: Green Supply Chain Management Practices (GSCM)

This section is seeking your opinion regarding the Green Supply Chain Management (GSCM) practices in your company. Please indicate [(1) = not considering it; (2) = planning to consider it; (3) = considering it; (4) = initiating implementation and (5) = implementing successfully] by *circling the number corresponding to the statements.*

No	Questions	Not considering it	Planning to consider it	Considering it currently	Initiating implementation	Implementing Successfully
B1	**Internal Environmental Management**					
IEM1	Commitment of GSCM from senior managers	1	2	3	4	5
IEM2	Support for GSCM from mid-level managers	1	2	3	4	5
IEM3	Cross-functional cooperation for environmental improvements	1	2	3	4	5
IEM4	Total quality environment management	1	2	3	4	5
IEM5	Environmental compliance and auditing programs	1	2	3	4	5
IEM6	Environmental management system exist	1	2	3	4	5

No	Questions	Not considering it	Planning to consider it	Considering it currently	Initiating implementatio	Implementing Successfully
B2	**Eco-Design**					
ED1	Design of products for reduced consumption of material/energy	1	2	3	4	5
ED2	Design of products for reuse, recycle, recovery of material, component parts	1	2	3	4	5
ED3	Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process.	1	2	3	4	5
No	**Questions**	**Not considering it**	**Planning to consider it**	**Considering it currently**	**Initiating implementation**	**Implementing Successfully**
B3	**Investment Recovery**					
IR1	Investment recovery (sale) or excess inventories/materials	1	2	3	4	5
IR2	Sale of scrap and used materials	1	2	3	4	5
IR3	Sale of excess capital equipment	1	2	3	4	5
No	**Questions**	**Not considering it**	**Planning to consider it**	**Considering it currently**	**Initiating implementation**	**Implementing Successfully**
B4	**Green Purchasing**					

GP1	Cooperation with suppliers for environmental objectives	1	2	3	4	5
GP2	Environmental audit for suppliers internal management	1	2	3	4	5
GP3	Suppliers' ISO 14000 certification	1	2	3	4	5
GP4	Second-tier supplier environmental friendly practice evaluation	1	2	3	4	5
B5	**Reverse logistics**					
RL1	Collects back used products from customers for recycling, reclamation of materials, or reuse	1	2	3	4	5
RL2	Collects back used packaging from customers for reuse or recycling	1	2	3	4	5
RL3	Requires suppliers to collect back their packaging materials	1	2	3	4	5
RL4	Returns back its products to suppliers for recycling, retaining of materials, or remanufacturing	1	2	3	4	5
RL5	Returns back its packaging to suppliers for reuse or recycling	1	2	3	4	5
RL6	Returns back the products from customers for safe refill	1	2	3	4	5
RL7	Positively launching recycle system	1	2	3	4	5
RL8	Setting internal material recycling system	1	2	3	4	5
RL9	Implementing recycle system and increasing profit	1	2	3	4	5

Section C: Organizational Performance

This section is seeking your opinion regarding the organizational performance in your company. Please indicate [(1) not at all; (2) = a little bit; (3) = to some degree; (4) = relatively significant; (5) = significant] by *circling the number corresponding to the statements.*

Organizational Performance

No	Questions	Not at all	A little bit	To some degree	Relatively Significant	Significant
E1	**Environmental**					
EP1	Environmental for air emission	1	2	3	4	5
EP2	Reduction of solid wastes	1	2	3	4	5
EP3	Reduction of waste water	1	2	3	4	5
EP4	Decrease of consumption for hazardous/harmful/toxic materials	1	2	3	4	5
EP5	Decrease of frequency for environmental accidents.	1	2	3	4	5
EP6	Improve an enterprise's environmental accidents	1	2	3	4	5
E2	**Positive Economic**					
PE1	Decrease of cost for materials purchasing	1	2	3	4	5
PE2	Decrease of cost for energy consumption	1	2	3	4	5
PE3	Decrease of fee for waste treatment	1	2	3	4	5
PE4	Decrease of fee for waste discharge	1	2	3	4	5

PE5	Decrease of fine for environmental accidents	1	2	3	4	5
E3	**Negative Economic**					
NE1	Increase of investment	1	2	3	4	5
NE2	Increase of operational cost	1	2	3	4	5
NE3	Increase of training cost	1	2	3	4	5
NE4	Increase of cost of purchasing	1	2	3	4	5
E4	**Competitiveness**					
CP1	Increased efficiency	1	2	3	4	5
CP2	Quality improvement	1	2	3	4	5
CP3	Productivity improvement	1	2	3	4	5
CP4	Cost saving	1	2	3	4	5

We sincerely appreciate for your time to complete this survey

~ The End ~

Appendix D

Permission Letter to Conduct Survey

UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

10 July 2012

To Whom It May Concern

Dear Sir/Madam

Permission to Conduct Survey

This is to confirm that the following students are currently pursuing their *Bachelor of Commerce (HONS) Accounting* program at the Faculty of Business and Finance, Universiti Tunku Abdul Rahman (UTAR) Perak Campus.

I would be most grateful if you could assist them by allowing them to conduct their research at your institution. All information collected will be kept confidential and used only for academic purposes.

The students are as follows:

Name of Student	**Student ID**
Too Jia Wen	09ABB03016
Chin Si Mei	09ABB03836
Ling Sing Yae	09ABB03108
Toong Siew Kuan	09ABB03266
Vivian Lai Jia Yin	09ABB03080

If you need further verification, please do not hesitate to contact me.

Thank you.

Yours sincerely

.....
Mahendra Kumar a/l Chelliah
Head of Department,
Faculty of Business and Finance
Email: mahendra@utar.edu.my

.....
Lee Voon Hsien
Supervisor,
Faculty of Business and Finance
Email: leevh@utar.edu.my

Address: 9, Jalan Bersatu 13/4, 46200 Petaling Jaya, Selangor Darul Ehsan, Malaysia **Postal Address:** P O Box 11384, 50744 Kuala Lumpur, Malaysia
Tel: (603)7958 2628 **Fax:** (603) 7956 1923 **Homepage:** http://www.utar.edu.my