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Environmental Supply Chain In United Arab
Emirates

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Abstract

Environmentally friendly practices are gaining major importance in United Arab Emirates. One of the biggest organisation challenges is integrating environmental practices, into the supply chain.

This study aims to identify the key determinants that will help increase and enhance the use of environmental supply chain management (ESCM) in organisations throughout United Arab Emirates.

Both qualitative and quantitative methods were used in this study. Primary data was collected through an online questionnaire and the secondary data was collected from academic journals, books and study cases. These findings were analysed using a statistical application (SPSS) and graphs to help develop an argument for exploring the findings.

The research findings show that Dubai and Abu Dhabi are the two leading Emirates with ESCM. It is also concluded from the findings that in order to increase the use of ESCM, there are needs to increase the consumer pressure, government and organisation regulations against negative impact on the environment. With the use of SPSS, it showed that implementing life cycle assessment to measure ESCM and appointing a separate department to manage ESCM could enhance the use of ESCM in organisations and potentially establishing competitive advantage.

The research findings from this study can help organisations to focus on their future in the U.A.E. and help the country move towards a more sustainable future.

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Tables of Content

Contents	Page No.
Chapter I - Introduction	1
1.1. Background	1
1.1.1. Regional Overview	3
1.2. Problem Statement	4
1.3. Research Limitations	5
1.4. Research Aims and Objectives	6
1.4.1. Aims of the Research	6
1.4.2. Objectives of the Research	6
1.4.2.1. Primary Objectives	7
1.4.2.2. Secondary Objectives	7
1.5. Thesis Organisations	8
1.5.1. Chapter I - Introduction	8
1.5.2. Chapter II – Literature Review	8
1.5.3. Chapter III – Research Methodology	8
1.5.4. Chapter IV – Research Findings, And Research Discussion	8
1.5.5. Chapter V – Conclusion And Future Recommendations	9
Chapter II - Literature Review	10
2.1. Introduction	10
2.2. Supply Chain Management	11
2.3. Environmental Supply Chain Management	13
2.4. United Arab Emirates' Environmental Concerns	16
2.5. Factors Influencing Environmental Supply Chain	18
2.5.1. Consumer Pressure	21
2.5.2. Legislation and Regulations	23
2.5.2.1. Environmental Laws In Europe	25
2.5.2.2. Environmental Laws In UAE	28
2.5.3. Competitive Advantage	29
2.5.4. Corporate Social Responsibilities	32
2.5.5. Cost Reduction	34

2.5.6.	Environmental Collaboration With Suppliers	37
2.5.6.1.	Supplier Selection	41
2.6.	Implementing Environmental Supply Chain	42
2.6.1.	Four Basic Steps In Implementing ESCM	44
2.6.2.	Implementing Sole Responsibility	45
2.6.3.	Implementing Environmental Certification	46
2.7.	Life Cycle Assessment (LCA)	48
2.7.1.	Data Envelopment Analysis	50
2.7.2.	GreenSCOR: An Analytical Tool	51
2.8.	Summary	53

Chapter III - Research Methodology **54**

3.1.	Introduction	54
3.2.	Research Hypotheses	55
3.2.1.	Hypothesis 1	55
3.2.2.	Hypothesis 2	55
3.2.3.	Hypothesis 3	55
3.3.	Sampling	56
3.4.	Data Collection	62
3.4.1.	Questionnaire Design	66
3.4.2.	Nature Of Data Collected In Questionnaires	68
3.4.3.	Pre- Testing Questionnaire	71
3.5.	Data Analysis	72
3.5.1.	Data Analysis Content	72
3.5.2.	Data Analysis Focus	72
3.6.	Reliability of Data	74
3.7.	Correlation And Significance Test	74
3.8.	Conclusion	76

Chapter IV - Research Findings And Results Discussion **78**

4.1.	Introduction	78
4.2.	Data Analysis Focus	79
4.3.	Description	80

4.3.1.	Sample	80
4.3.2.	Organisations Studied	81
4.3.3.	Organisation's Locations	81
4.3.4.	Market Sectors Of Organisations Studies	82
4.3.5.	Size Of Organisations Studies	84
4.3.6.	Usage Of Environmental Supply Chain Management	87
4.3.6.1.	Adoption of Environmental Supply Chain Management	87
4.3.6.2.	Reasons to Adopt Environmental Supply Chain Management	91
4.3.6.3.	Reasons Not to Adopt Environmental Supply Chain Management	94
4.3.7.	Life Cycle Assessment	97
4.4.	Estimation	98
4.4.1.	Comparing This Research and “The Green Supply Chain In Dubai”	98
4.5.	Correlation Analysis	101
4.5.1.	Hypotheses	103
4.5.2.	Results	104
4.6.	Summary Of Findings	105
4.7.	Results Discussion	106
4.7.1.	Emirates Leading the Way	106
4.7.2.	Key Drivers of Environmental Supply Chain Management	107
4.7.2.	Comparing This Research and “The Green Supply Chain In Dubai”	111
4.7.3.	Life Cycle Assessment	111
4.7.4.	Separate Department for Managing Environmental Supply Chain	113
4.8.	Summary	115
Chapter V - Conclusion and Future Recommendations		116
5.1.	Limitations	116
5.2.	Conclusion	117
5.3.	Recommendations	119
References		121
Bibliography		138
Appendix		139

List of Figures	Page No.
Figure 2.1. Development of environmental costs for proactive trendsetters and reactive followers (Brezet and Van Hemel, 1997)	25
Figure 2.2. Conceptual Model linking tangible/intangible assets, VRIO Characteristics of the PM process. (Mathis et al, 2007)	31
Figure 2.3. Four Basic Steps to implement Environmental Supply Chain Management	45
Figure 2.4. Environmental Impact At Each Stage of the Supply Chain (Cognizant, 2008)	52
Figure 4.1. Percentage of Completed/Incomplete Respondents For Each Emirate	82
Figure 4.2. Percentage of Respondents of UAE In their Respective Markets	83
Figure 4.3. Percentage of Respondents In Their Respective Markets For Each Emirate	84
Figure 4.4. Sizes of Organisations' That Have Responded From Each Emirate	85
Figure 4.5. Summary of Sizes of Organisations that Have Responded In the UAE	86
Figure 4.6. Sizes of Respondents' Organisations in the Different Markets	87
Figure 4.7. Percentage of Organisations that have responded, considering Environmental Supply Chain Management	88
Figure 4.8. Organisations from Each Emirate considering adopting Environmental Supply Chain Management	89
Figure 4.9. Respondents from the different markets who are considering Environmental Supply Chain Management	90
Figure 4.10. Reasons Respondents in the UAE have adopted the Environmental Supply Chain Management	92
Figure 4.11. Reasons Each Emirate Has Adopted Environmental Supply Chain Management	93
Figure 4.12. Reasons to adopt Environmental Supply Chain Management in Different Organisation Sizes.	94
Figure 4.13. Reasons for Not Adopting Environmental Supply Chain Management in the United Arab Emirates	95

Figure 4.14. Reasons for Not Adopting Environmental Supply Chain Management in the United Arab Emirates Market Sectors	96
Figure 4.15. The use Of Life Cycle Assessment Among Organisations that have already adopted ESCM.	97
Figure 4.16. The Use Of Life Cycle Assessment Among the Different Organisation Sizes.	98
Figure 4.17. (a) Maturity of Green Supply Chain (Rettab and Ben Brik, 2008)	99
Figure 4.18. Increase in Organisation using ESCM in Dubai since 2008	99
Figure 4.19. (b) Maturity of Green Supply Chain (Rettab and Bin Brik, 2008)	100
Figure 4.20. Organisations Considering adopting the Environmental Supply Chain management in Dubai	101
Figure 4.21. Organisations that have Senior Managers Responsible for Environmental Supply Chain management	102
Figure 4.22. How ESCM has helped Organisations?	103

List of Tables

Page No.

Table 2.1.	Comparison of Descriptions of Supply Chain Management by Different Authors	12
Table 2.2.	Comparison and Description of Environmental Supply Chain Management by Different Authors	14
Table 2.3.	SCOR Process Environmental Impacts (Cash and Wilkerson, 2003).	52
Table 3.1.	Comparison of probability and non-probability sampling designs	60
Table 3.2.	Research objectives and constructs for the study	67
Table 3.3.	Link of objectives, constructs, questions, data levels and variables	70
Table 3.4.	Steps for Hypothesis testing (Diamantopoulos and Schlegelmilch, 2002).	74
Table 4.1.	Correlation is significant at the 0.01 level (2-tailed)	104
Table 4.2.	Status of Hypotheses	105

CHAPTER I

Introduction

1.1. Background

Environmentally friendly renewable resources are gaining major importance. Manufacturers and end users are getting more active towards eco-friendly aspects of products and services and environmental practices are accepted in many organisations. The supply chain management system is moving into a new dimension and turning into environmental supply chain management system. Environment conservation fights like “Greener Building” also known as “Green Construction” and “Sustainable Building” are slowly getting out of boardroom meetings to practical applications such as the Environmental or Sustainable Supply Chain Management. Modern business management is embracing the idea that success needs a multi network approach that includes successful coordination, amalgamation with other partners for forming and managing successful supply chains. There are more organisations in today’s world of business that are looking into integrating environmental practices into their decision making procedures and operations (Sarkis, 2003); such environmental practices can be integrated with supply chain management to form environmental supply chain management.

One of the biggest challenges for companies in the 21st century is the growing need for integrating proper or practical environmental choices into supply chain and logistics practices. Environmental Supply Chain Management is closely related to the broader concept of sustainability. It involves adopting an environmentally conscious mindset in conducting numerous company level (strategic, tactical and operational) processes and the development of practical strategies around environmental impact issues. The central assumption of most Environmental Supply Chain Management initiatives is that the investments in sustainability can lead to resource saving, minimize waste, and improve productivity, promoting efficiency and synergy among company partners. Green initiatives that involve key partners will not only have a positive impact on the environment and yield increased efficiencies, but also certainly create enhance competitive advantages in environmental innovations and operations for all partners (Porter and Van der Linde, 1995).

Sustainability is can be understood as “a possible way of living or being in which individuals, firms, governments, and other institutions are responsible for taking care of the future as if it belonged to them today, for equitably sharing the ecological resources on which the survival of human and other species depends, and for assuring that all who live today and in the future will be able to satisfy their needs and human aspiration” (Ehrenfeld, 1999). Johansson (2001) would simplify this and say that it is a way in which all the present needs are met without negatively impacting the environment, and at the same time preserving the environment for future generations.

1.1.1. Regional Overview

This research is based on United Arab Emirates (U.A.E.). The country (U.A.E.) is a federation of Seven Emirates located in the Arabian Peninsula formed in 1971. The Emirates are Abu Dhabi, Dubai, Sharjah, Ajman, Fujairah, Ras Al Khaimah, and Umm Al Quwain. Each Emirate maintains a large degree of independence. The Supreme Council of Rulers made of Seven Sheikhs governs United Arab Emirates; they are responsible with appointing the Prime Minister of the Cabin.

Over the years there has been a marked change in the industrial sectors throughout the world. Especially the United Arab Emirates is experiencing a major shift from the stand-alone unit business to the supply chain management system. In fact every industry is now gradually resorting to the supply chain process for enhancing the profitability and business prospects both in respect of inland business and overseas. At the same time there is also a noticeable progress in the recent years towards consciousness about environment and customers are more and more inclined towards the eco-friendly aspects of the products and services offered to them by the providers.

In the United Arab Emirates the environment itself requires that there is least pollution. On the other hand the economically affluent society is now becoming conscious about the evil effects of massive industrialization. Industrialists and entrepreneurs cannot afford to ignore any more the requirements of the modern ages. That is why on the one hand they set up supply chain management systems to cope with the advancement of technologies and new demands of the

customers all around and at the same time try to show socially responsible behaviour. A basic ingredient of social responsibility is minimizing pollution and creating products that are real eco-compliant.

1.2. Problem Statement

Organisations used to compete over price and quality of products and services, but now the angles of competition have changed. They are now competing over sustainability or other environmental issues. One of the ways of achieving competitive advantage is adopting an environmental supply chain management. It is also important, how environmental supply chain management is used and this can also be a factor in the success of an organisations project.

The main research issue in this study is obtaining a solution that will help increase and enhance the use of environmental supply chain management; hence it encourages standards of good practice in organisations ethics, corporate, and environmental responsibilities. This will allow organisations to focus on their future in the United Arab Emirates and help the country move towards a more sustainable future. This will in turn promote United Arab Emirates as an environmentally friendly or sustainable country in a whole and proceed to lead the way for other Middle Eastern Countries in the path of “Sustainability”.

Past empirical works were done on the eco-friendliness in environmental supply chain management in major industries in Dubai only; this was carried out by Dr. Beliad Rettab and Dr. Anis Ben Brik in 2008. Unlike their study, this research takes all Seven Emirates in the United Arab Emirates into consideration and all

industry types. This research also adds a new variable “Life Cycle Assessment”, and a new tool (SPSS) to help better analyse the data and the different theories that would allow organisations to make a better decision on how they will use the environmental supply chain management.

This research uses both primary and secondary data. The secondary data was collected from academic journals, books and websites. The literature collected, reviews the environmental supply chain management and factors, which influence organisations to adopt this method to manage their supply chain. As for primary data, it was collected through an online questionnaire, sent via electronic mail to organisations in all Seven Emirates. These findings will later on be analysed using a statistical application called SPSS.

1.3. Research Limitations

Several limitations pertain to this study:

- **The study used a forced choice survey instrument.**

The questions presented in the questionnaire would not allow the respondent to state his or her view regarding the question, but had to choose from the answers available for choosing. This may therefore mean that the answers might not accurately represent the point of view of the respondent but represents the most closely related point of view.

- **The study focuses on only the United Arab Emirates.**

Therefore the findings cannot be generalized to a broader population in other regions.

- **Limited research time.**

There was absolutely no opportunity for the researcher to contact organisations, to review their environmental supply chain management systems and conduct interviews for a better understanding of how organisations are utilizing this system.

1.4. Research Aims and Objectives

1.4.1. Aims of the Research

The aim of this study is to identify the key determinants that will help increase and enhance the use of environmental supply chain management in organisations throughout the United Arab Emirates, in order to promote the country as an environmental friendly country.

1.4.2. Objectives of the Research

The research objectives are divided into three (3) primary objectives focussing on how to increase environmental supply chain management and two (2) secondary objectives focusing on how to enhance environmental supply chain management.

1.4.2.1. Primary Objectives

The primary objective of the research is to identify how the use of environmental supply chain management can be increased by:

- Identify the leading emirate in the application of environmental supply chain management in the United Arab Emirate
- Identify the key drivers to using environmental supply chain management in the United Arab Emirates.
- Compare the results obtained in this research with that of Dr. Anis Ben Brik and Dr. Beliad Rettab of 2008.

1.4.2.2. Secondary Objectives

The secondary objective of the research is to identify how environmental supply chain management can be enhanced by:

- Identifying the relation between organisations that use “Life Cycle Assessment”, and their success rate.
- Identifying the relation between organisations that have a senior manager or department whose only role is to manage the environmental supply chain management and, their success rate.

1.5. Thesis Organisations

This research paper is comprised of five (5) chapters, discussed in the following sections:

1.5.1. Chapter I - Introduction

The first chapter discusses the area of interest and the region. The chapter also briefly discusses the problem investigated and the main purpose of this study. The aims and objectives are presented

1.5.2. Chapter II – Literature Review

The second chapter reviews the literature of environmental supply chain management and several key aspects that help enhance as well as increase the use of environmental supply chain management in the United Arab Emirates.

1.5.3. Chapter III – Research Methodology

The third chapter discusses the study's methodology selected, and how primary and secondary data is collected. The chapter concludes with the reason behind the use of this approach

1.5.4. Chapter IV – Research Findings And Results Discussion

The fourth chapter presents the study's results. These results were obtained from the analysis of the primary and secondary data collected and responds to the objectives presented in the first chapter. The results are presented in graphs to help the reader to easily understand the findings.

1.5.5. Chapter V – Conclusion and Future Recommendations

The fifth chapter concludes the research with justification of the research and a summary of the findings. This chapter also presents the study's recommendations for future research and also discusses all limitations that only came to arise during or towards the end of the project.

CHAPTER II

Literature Review

2.1. Introduction

Over the years there has been a marked change in the industrial sectors throughout the world. The number of organisations that are looking into integrating environmental practices into their decision making procedure and other daily operations is increasing (Sarkis, 2003). Khoo et al (2001) mentions how businesses these days are pressured into balancing marketing and environmental practice. The market is extremely competitive and is more concerned about all kinds of environmental issues and how they can affect the planet.

Especially UAE is experiencing a major shift from the stand-alone unit business to the supply chain management system. In fact every industry is now gradually moving towards the supply chain process for enhancing the profitability and business prospects both in respect of inland business and overseas. At the same time there is also a noticeable progress in the recent years towards consciousness about environment and customers are more interested in the eco-friendly aspects of the products and services offered to them by the providers.

How can one increase and enhance the use environmental supply chain management systems in organisations within United Arab Emirates, and then how will we manage to measure the environmental impact? This study sought to answer this question by gauging the levels of maturity of organisations in United Arab Emirates with regards to “Environmental Supply Chain Management” as well as identifying the main trends in the field.

2.2. Supply Chain Management

Before moving over to further readings on environmental supply chain management system, discussing its roots will give you a better understanding of the concept and how it applies to this research.

Multiple approaches are usually adopted for project management purposes. Such approaches could be agile, incremental, interactive, or even faded ones. Whatever the method and approach is, attention should be given to the overall project objectives as well as the time span, costs involved, roles, rights and responsibilities of the participants and stakeholders in the process. Purchasing, sourcing, and supplying are all ingredients of the supply chain management systems. Project managers use different tools and methods or applications or techniques in order to reach certain goals and objectives, and supply chain management is one of them. **Table 2.1** explores and compares the different ways researchers have described supply chain management, since 1982. **Table 2.1** will help in better understanding the concept of supply chain management and all the areas that might affect an organisation.

Authors	Description
Harland (1996)	Supply chain management (SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers
Cooper et al. (1997)	An integrating philosophy to manage the total flow of a distribution channel from supplier to ultimate customer.
Mentzer et al (2001)	Supply Chain Management is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.
Oliver and Webber (1982)	Supply Chain Management covers the flow of goods from supplier through manufacturing and distribution chains to end-user
Christopher (1992),	Supply Chain Management is the management of a network of organisations that are involved, through upstream linkages, in different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.
Ellram, (1991)	A network of firms interacting to deliver product or service to the end customer, linking flows from raw material supply to final delivery
Tan et al. (1998)	Supply chain management encompasses materials /supply management from the supply of basic raw materials to final product. Supply chain management focuses on how firms utilize their suppliers ' processes, technology and capability to enhance competitive advantage. It's a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency
Ho et al (2009)	The traditional supply chain comprises five parts: raw material, industry, distribution, consumer, and waste. Each of the links in the supply chain can be a reason for pollution, waste, and other hazards to the environment. Regarding raw materials, a company may use environmentally harmful materials such as lead. However, organisations can put pressures on suppliers to use more environmentally friendly materials and processes.

Table 2.1. Comparison of Descriptions of Supply Chain Management by Different Authors

Skirtmore and Albaloushi (2008) in an endeavour to reveal the degree to which awareness affects the United Arab Emirates' construction industry Supply Chain Management, state that Supply Chain Management (SCM) enhances trust among chain partners and is a good innovation that is useful in management in the construction industry. In the UAE construction industry employing 16,000 contractors and 340,000 workers and is by far the largest single industry with an estimated turnover of about US\$30 billion.

2.3. Environmental Supply Chain Management

The Supply Chains are at the same time required to be environmentally friendly. A supply chain is a network of relationships and multiple businesses interacting to deliver a product or service to the end user or customer. An emerging area in supply chain management practice has introduced environmental supply chain management or green supply chain management and is defined as the integration of environmental thinking in to supply chain management from design, manufacturing and other elements of the supply chain library (Srivastava, 2007).

Environmental chain supply is defined as the set policies safeguarding the environment from pollution within the supply chain. The environmental or green supply chain management is concerned with the acquisition of raw materials, the production processes, the distribution of the goods and services, the final use, available substitute materials and recycling procedures with regard to the environment. The environmental or green supply chain management also

provides training, green design initiatives and information to build the suppliers' environmental management competencies.

Table 2.2 explores and compares the different ways researchers have described environmental or green supply chain management. These descriptions give a better understanding about the importance of using life cycle assessment this is discussed further in section 2.7 of the same chapter.

Author	Description
Zhou, 2009	The environmental or green supply chain management is a kind of modern management mode which could comprehensively consider the environmental influence and resource utilization efficiency in the whole supply chain and how to implement the green supply chain management in special industrial operation at present has become into one of hotspot problems
Walton et al., 1998; Hervani et al., 2005	Environmental or green supply chain management is defined as integrating suppliers into environmental management processes
Narasimhan and Carter, 1998	Environmental or green supply chain management consists of the purchasing function's involvement in activities that include waste reduction, recycling, reuse and the substitution of materials
Zhu, 2008; Gilbert, 2000	Environmental or green supply chain management can be defined as integrating environmental concerns into supply chain management

Table 2.2. Comparison and Description of Environmental Supply Chain Management by Different Authors

One of the most comprehensive research works on environmental issues came from De Burgos and Lorente (2001) who dealt with the environmental

performances as the operations objective. Another researcher Baumann et al (2002) also attempted the review the environmental supply chain management but remained mostly confined to reviews on green product development. While researchers like Zsidisin and Sifred (2001), Carter and Ellram (1998), Snir (2001) and Chen (2001) went deeper in to the environmental supply chain management issues, although they did not cover all the aspects of the environmental supply chain management, but, focusing mainly on logistic management, green purchasing, product stewardship and design for the environment journals, and treated supply chain management as its subset. They gave a much better in perspective was the journal paper by Kleindorfer et al (2005). Coming closest to the issues, they reviewed “Sustainable Operations Management” and “Production and Operations Management” and emphasized the issues relating to environmental supply chain management. Seuring and Müller (2008a) present a more comprehensive overview of environmental supply chain management literature, comprising of about 191 papers published from between 1994 to 2007.

The concept of environmental or green supply chain management was first put forward by United States Michigan State University in 1996 (Hadfield, 1996), academes began to study various aspects of the environmental or green supply chain management (Beaman, 1999; Joseph, 2003; Jiu-Biing, 2005; Herman et al, 2005; Srivastava, 2007; Wu, 2003; Wu, 2004; Liu, 2006; Wang, 2003;).

2.4. United Arab Emirates' Environmental Concerns

Dubai and Abu Dhabi are the emirates taking the lead when it comes to sustainable development. Abu Dhabi is the home of the world's first carbon-neutral, zero-waste city, Masdar City (www.masdarcity.com). Their main aim is to become the Silicon Valley for clean, green and alternative energy. This city will fund current and future projects, researched, developed, tested and implemented. The Mubadala Development Company owns Masdar, which is the Abu Dhabi government's investment vehicle. Dubai has launched ENPARK (www.enpark.ae), the Energy and Environmental Park, a sustainable community and a Free Zone that will look into energy conservation and solar and wind schemes to help meet electricity needs, their ambition is to build a sustainable culture. Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai said that 4% of peak electricity needs could be saved by 2015 through a demand management program (Van Den Broek, 2010).

In Rettab and Briks' research (2008), for Dubai only, it was found that few companies (less than 40%) factor environmental supply chain (green design, green sourcing, green operations/manufacturing) into their management strategic decisions. The degree to which companies subscribe to the green supply chain depends on the size of the company; large companies (40.9%) are more concerned of the environmental impacts of their product life cycle compared to the small companies (29.4%).

Companies, which had adopted the environmental supply chain in decision-making, were largely driven by consumer expectation. Partly to comply with the following factors:

1. The laid down regulations, policies and strategies of multi nationals,
2. Competitor behaviour
3. Regulations by export countries
4. The reduction on cost.

The local government regulations are the driver force for transport, storage and communication sector whereas consumer awareness is the driver force for hotels, real estates and restaurants. It is therefore important to develop knowledge of the consumers on social and environmental issues about the environmental supply chain to push more companies to using it (Rettab and Brik 2008).

Their study revealed that the biggest impediment to the use of environmental supply chain management had to do with lack of knowledge, followed by lack of supplier awareness, lack of commitment to deal with environmental supply chain issues and some argued that it was complex to implement in their daily operations. It will be important to note that only about 10% said that lack of financial ability was the key barrier to using environmental supply chain (Rettab and Brik 2008).

Most of the companies had a manager whose principal role among the rest was to manage environmental supply chain issues. This also varied depending on the size of the company, 81% of large companies had a manager, and 56 % of

medium sized and 30.5% only of the small companies had the same position (Rettab and Brik 2008). This research will investigate if having a manager whose principal role is managing the environmental supply chain will affect the success rate of the organisations projects or not.

Rettab and Brik finally recommend a more dynamic way of assessing the impacts of a supply chain by the companies; they should work in line with the suppliers to improve their environmental performance. They further suggest that companies should come up with an Environmental Supply Chain training program and unlike the past make open their environmental friendly approaches in the supply chain, evaluate suppliers on their environmental performance. The suppliers should come up with, execute and maintain a universal standard of Environmental Management System (Rettab and Brik 2008).

2.5. Factors Influencing Environmental Supply Chain

Organisations are integrating the supply chain with environmental influence in attempt to save on cost and be able to provide their customers with better services and products, improved to include environmental requirements. This is now become a trend. These trends provide an opportunity to exceed expectations of governments and customers through supply chain collaboration; these include the ability to see supply chain members' commitment to Environmental Friendly Practices (Walton et al, 1998).

Factors that influence the environmental supply chain management system are the environmental values and commitments of suppliers towards the customers,

employees, and others and whether they have put in place an environmental management system. Another important factor is the accountability part. Legal appliances with federal, state, and local environmental laws and environmental specifications are also important.

Before the 1970s organisations that took environmental issues into perspective regarded it as a secondary issue, something that need not be discussed at great levels. But now organisations are getting more conscious towards environmental issues and regard it as a primary issue, thanks to the efforts of environmentalists, governments, and media together, about the growing dangers of environmental pollutions all over the world (Meadows et al., 1972; Hart, 1995).

In United Arab Emirates the issue takes a greater dimension because the environment itself requires that there should be very little pollution. On the other hand the economically affluent society is now becoming conscious about the evil effects of massive industrialization. Industrialists and entrepreneurs cannot afford to ignore any more the requirements of the modern ages. That is they set up supply chain management systems to handle new demands of the customers all around, setup laws and regulations regarding the environmental issue and at the same time try to show socially responsible behaviour. A basic ingredient of social responsibility is minimizing pollution and creating products that are real eco-compliant. This is probably the reason why Abu Dhabi has gone ahead with the US\$22 Billion project to build a green energy city taking advantage of the fallout of the global crisis. This would be the first carbon-neutral, i.e. zero-waste city in the world. This project is seeking to benefit from cost reductions and a

lack of business opportunities elsewhere and strong government support, (ADCCIID, 2009).

For example, in China, the Chinese automotive industry has also seen a sudden rise and modernization in the recent past leading to environmental burdens and resource shortages. More than industrial pollution vehicles have replaced industries when it comes to air pollution compromising the air quality. The Chinese automobile Supply managers were faced with increased pressures from all quarters requiring their implementation of the environmental supply chain management practices to cut down on their environmental impacts and at the same time improve their economic performance with regards to enhanced competition from the other world vehicle manufacturers. The environmental supply chain management practices in the automotive supply chain are not that thriving since very few have been fully adopted i.e. eco-design, internal environmental management and investment recovery. Other aspects of environmental supply chain management like recycling are not being put into use partly because of the demand of the local market. However there is a legislation requiring the Chinese automobile system to develop a take back system of the used cars to close the supply chain. The environmental supply chain management motivating factors (pressures/drivers) of the automotive industry are regulation by both the government, market requirements by the consumers, internal incentives and supplier drivers while the practices involved are customer cooperation with environmental concerns, investment recovery, green purchasing and internal environmental management. The Chinese automobile chain supply has strong internal pressure to adopt environmental

supply chain management practices unlike the external pressures like customer cooperation and green purchases. It has therefore not made any significant improvement on improving environmental affairs. There is still some room for improvement on the use of environmental supply chain management in the China automobile company (Zhu et al 2007).

According to Welford (1998), Brezet and van Hemel (1997), Hall (2000), Banerjee et al. (2003), Simpson et al. (2004), there are several reasons why organisations are addressing environmental issues; The six major reasons are consumer pressure, legislation and regulations, competitive advantage, corporate social responsibilities, cost savings and collaboration with suppliers. These reasons are explain in detail in the following sections.

2.5.1. Consumer Pressure

All over the world and also in United Arab Emirates the consumers are now shunning items and products that contain materials those are manufactured under sweatshop labour conditions or in less environmentally friendly conditions. Consumer pressures researchers in the areas of innovation management, and new product developments have suggested that customer demands can be one of the significant drivers of innovation of organisations and change (Salam, 2007). Customers are increasingly becoming concerned about the safety and environmental impacts as well as origin of the products. It is also possible that suppliers would try to avoid losing a contract due to unsatisfied environmental performance since this could give a bad reputation, and thus try to satisfy the customer.

A major factor affecting the supply chain is the consumer demands and the change in behaviours of buying by the consumers. They are demanding for value added products and more environmental friendly produce. The demands for the consumers are governed by security, price, quality, quantity, shelf life and sensory properties among other things (Ondersteijn et al. 2006). Suppliers are required to monitor their costs of waste, which should be audited, by the environmental management authorities and quality assurance bodies in conjunction with the financial analysts.

Hall (2000) stresses on the importance of consumer pressure and has shown the relationship between the pressures companies experience and what the companies have done to due to that pressure. Industrial and organisational activities have caused resource depletion and increasingly detrimental environmental situations; Governments have come to enforce stricter legislation, regulations and public scrutiny (Zhu et al, 2008). Pressures from government, customers and various stakeholder groups have enforced organisations to incorporate environmental or green supply chain management schemes (Sharman et al., 1997; Perez-Sanchez et al., 2003; Nawrocka, 2008; Searing and Müller, 2008b, Gold et al, 2009). Even manufacturing managers have adopted various strategies to address the impact of their operations and products on the natural environment, as they face intense scrutiny from diverse stakeholder groups, including end-consumers, industrial customers, suppliers, and financial institutions (Henriques and Sadorsky, 1999; Klassen and Vachon, 2008). And because of the Public Procurement Act in Norway tender announcements that

included environmental demands increased from 58 percent in 2004 to 66 percent in 2005.

2.5.2. Legislation and Regulations

One of the most important aspects of creating the effective supply chain management system is the Government regulations as the organisations are required to comply with government regulations including legislations in the areas of safety and environment especially. Environmental regulation can create operating barriers and might in some cases increase or decrease costs for businesses as they include environmental directives, and sometime taxes and fees, and liability. It was suggested also that compliance with environmental regulations is one of the short-term responses by the business. Stock (1992, 1998) and Kopicki et al. (1993) have suggested that organisations that are more involved with environmental supply chain management are more likely to comply with regulations that are imposed to them, while Porter (1991) proposes that environmental regulation and subsequent actions by organisations can lead to competitive advantage.

Some of the environmental regulations and laws are needed because some companies are not aware of existing benefits and cost saving potential (Porter and Van der Linde, 1995; Hadfield et al., 1997). Porter and Van der Linde (1995) also stated that these regulations must do more than just avoid environmental impacts, but also create opportunity for innovation and by letting organisations find their own way in resolving problems, hence creating an opportunity for competitive advantage.

Legislations are coming over in United States enforcing stricter environmental regulations. Europe has already passed several laws and the most notable among them is Hazardous Substances Directive (RoHS) Restricting the amount of substances in the electrical and electronic equipments (Cusack and Parrett, 2006). China has also come up with its own RoHS law (Hicks et al, 2005), which is more stringent than the European counterpart. It embeds all the restrictions of the European legislation and it requires “laboratory testing and labelling equipments”. In Norway the Public Procurement Act states that all official bodies have a legal obligation to take environmental performance of products into consideration when new acquisitions are planned (Michelsen and de Boer, 2009)

The laws and regulations are usually based on best practices of other organisations, which is why Handy (2002) would advise organisations to take the lead in terms of environmental issues instead of being put on defence. See **Figure 2.1** it shows a schematic picture of what was discussed by Handy (2002), where the trendsetters have higher environmental costs in the beginning at time equal to t_1 , which eventually levels off at time equal to t_2 . The followers experience escalating costs caused by the need to catch up (Brezet and Van Hemel 1997). The x – axis is the time and the y – axis is the environmental concerns; t_1 is at any time and t_2 and a time after t_1 .

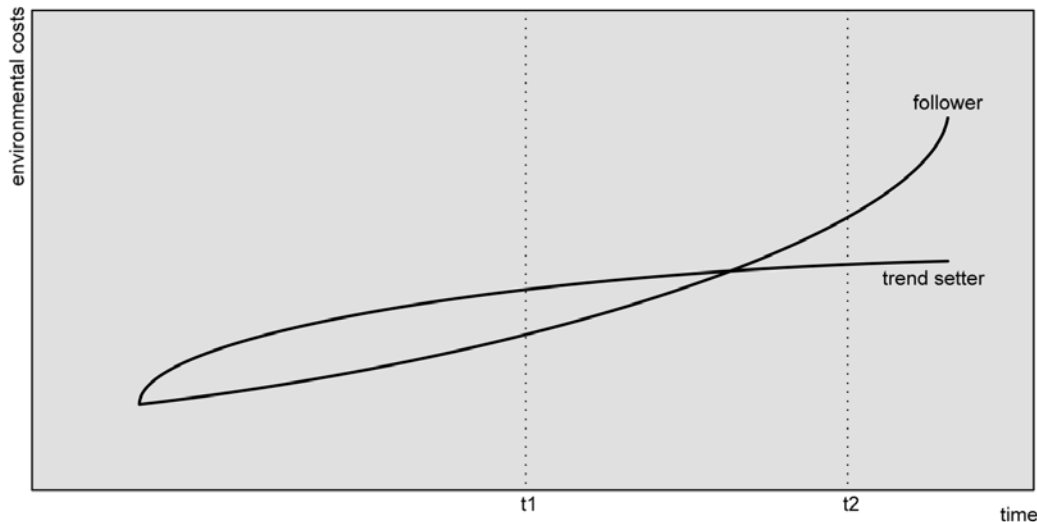


Figure 2.1. Development of environmental costs for proactive trendsetters and reactive followers (Brezet and Van Hemel, 1997)

Some Companies might set standards for suppliers regarding environmental quality, they might monitor the performance of their suppliers and they might also help them to achieve the standards. Here, environmental performance acts as an order qualifier (Hadfield et al., 2005) and if the suppliers do not meet the requirements, they loose this business opportunity. These regulations can be seen as vertical regulations and they can be in the form of certification.

2.5.2.1. Environmental Regulations In Europe

A study trying to asses the opportunities and challenges faced by small and medium enterprises (SME) in greenhouse gas emissions and solid waste management shows that most of the large corporations had adopted green procurement policy not only to secure the good social and environmental responsibility but also because it had positive financial impacts (Lopez et al. 2005). Government interest and those of their employees have been the major driver force in implementing environmental initiatives. It took into

consideration the horizontal initiatives across the supply chains and the vertical initiative taken along the supply chains.

Due to the emerging problems of climate change and green house gas (GHG) emissions there is rising need for the supply chains to be managed effectively to obtain sustainability of the global environment. This has led to the rise of environmental supply chain management with companies like IBM, Xerox and Hewlett-Packard leading the pack in green-manufacturing, green-marketing and green logistics. Governments of Europe, Japan and North America have legislations that promote the environmental supply chain management requirements. The legislations among other things encourage recycling of used to products to reduce industrial pollutions by the supply chains. Most big companies are yet to fully embrace the idea of sustainability despite their financial ability. Some argue out that it is because of the mixed messages received from the stakeholders, regulators and the government (Wisner et al. 2008).

The study took three medium sized enterprises in Nova Scotia and their suppliers since the small and medium enterprises account for 98% of all business with almost a 50% blame of all the pollution that occurs (Lopez et al. 2005). Interesting turn of events is the fact that the pollutants load in the environment both water; air and land by the small and medium enterprises has been has been on the rise. Many of the small and medium enterprises have limited environmental expertise, they do not have means of quantifying their energy data, and they have limited financial resources and low

technical resources and low environmental expertise. Out of every 10, eight had environment management systems and inversely only two out of ten had environmental regulation policies to be met by the suppliers. The study points out that lack of time due to competing priorities is a major barrier when it comes to addressing solid waste management by the companies even more than issues of financial resources. This calls for flexibility to minimize conflicting priorities and help achieve the goals of the environmental supply chain management. The small suppliers directed all their resources in their manufacturing activities or providing the service and had a problem transforming any resources to environmental issues since they felt this was not part of their core function. Lopez et al. realized despite some enterprises engaging in recycling, there was still some room for improvement in the field of recycling to cut on the energy consumption to be used in recycling products. The study points out that despite the individual actions on the supply chain having minimum benefits, the overall gain from implementing each of the actions is significant and can help a big deal in reducing the green house gas (GHG) emissions and solid waste management. Most of the managers of the small and medium enterprises were not aware of the energy and solid waste disposal making it the biggest challenge for the environmental supply chain management. They conclude by pointing out that it is important to develop environmental knowledge and convert it into action within the small and medium enterprises via the managerial population. Despite an increasing number of corporations adopting the environmental procurement policies it is evident that they are not well developed in the Nova Scotia (Lopez et al. 2005).

2.5.2.2. Environmental Laws In United Arab Emirates

Having a look at the environmental laws in United Arab Emirates would be essential for understanding the background of environmental supply chain management system there. Body of Environmental Law in the United Arab Emirates comprises the Federal Laws as well as local orders issued at municipal level within the area of the emirate (Al Tamimi and Company, 2009). These laws form the backbone of the environmental law within the United Arab Emirates that deals specifically with the environmental impact assessments, the procedures involve and responsibilities implementing the laws.

For instance the law no.24 contains the following principles (Zawya, 2009):

- a) Protection and conservation of the quality as well as natural balance of the environment.
- b) Controlling all forms of pollution as well as avoidance of any immediate or long-term harmful effects that results from planning for economic.
- c) Agricultural or industrial development or other programs aimed at improving the life standards should also be sustainable.
- d) Creating coordination among the FEA, competent authorities, and parties concerned with the protection of the environment and conservation and consolidation environment awareness and principles of pollution control.

- e) Development of natural resources and conservation of biological diversity in the United Arab Emirates and exploitation of such resources with consideration of present and future generations.
- f) Protection of society, the health of human beings and other living creatures from any activities and acts, which are environmentally harmful or impede authorized use of the environmental setting.
- g) Protection of the United Arab Emirates environment from the harmful effects of activities undertaken outside the region of the United Arab Emirates.
- h) Compliance with international and regional conventions ratified or approved by the UAE regarding environmental protection, control of pollution and conservation of natural resources.

2.5.3. Competitive Advantage

Environmental Supply Chain Management can be used as a competitive advantage. In East Asia, the organisations that used to compete over price and quality have changed their view angle and are now competing more on the environmental issues as well, because that is where competitive advantage could be gained (Bansal, 2000). The organisations believes due to the economic downfall, especially in the property market in United Arab Emirates, their main responsibility is to make profit and broaden their services outside their region, to all over the Middle East Region. The organisations could develop ecologically related resources and capabilities to build long-term profit potential, like improving reputation, process efficiencies, and product reliability (Shrivastava, 1995; Hart, 1995; Olsen, 2008).

Project management's potential as a source of competitive advantage will depend on the extent to which the company develops the processes to have VRIO characteristics (Mathis et al, 2007), see **Figure 2.2** Intangible project management assets are found to be a source of competitive advantage. Barney (1991) list four essential requirements for a resource/skill to be a source of sustainable competitive advantage "SCA"; it must be valuable, unique, hard to imitate, and must not have any strategically equivalent substitutes, embedding "green" in the company's current process would mean the company will have a competitive advantage over other companies, and this new product possess all four requirements to be a source of SCA, in the Middle East Region.

The decision that buildings in Dubai will have to be constructed as per environment-friendly "green building" standards from January last year makes Dubai the first city in the Middle East (Landis, 2007). Soon other Middle East region will implement this and the company needs to be ready if they want to have a competitive advantage over other organisations. Humphrey (2001) expresses that the concept of "governance" is central to the global value chain approach. This term expresses that some firms in the chain set and/or enforce the parameters under which others in the chain operate. A chain without governance would just be a string of market relations. Governance will make strong companies require from their suppliers good environmental practices and high environmental performance as a strategy to differentiate their product and/or create an environmentally friendly image in the market. Companies have already been increasing their market share by the image of higher environmental performance.

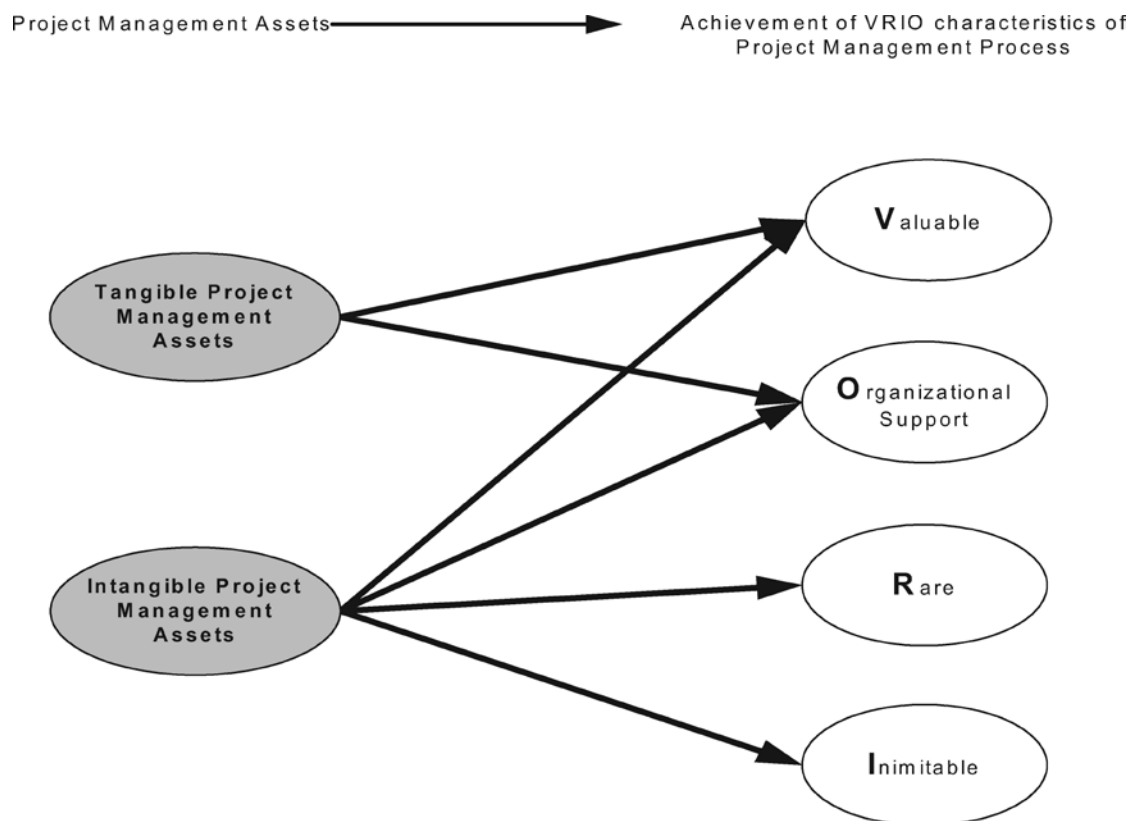


Figure 2.2. Conceptual Model linking tangible/intangible assets, VRIO characteristics of the PM process. (Mathis et al, 2007)

Fact remains that practicing environmental supply chain management can help the organisations in entering into regions those might not have been supportive previously or welcoming to the business. “The not-in-my backyard or NIMBY syndrome may be lessened if the reputation of the organisations within the supply chain is enhanced with sustainable organisational practices.” (Saris, 2009).

The organisations that have foresight are using environmental issues to their advantages. Innovating and coming up with many cutting edge solutions they

are emerging on more profitable path and at the same time are able to help the environmental protections. Anything not in a product is considered a cost it's a sign of poor quality. The U.S. global conglomerate 3M has a program called Pollution Prevention Pays (3P). The company's policy is that "anything not in a product is considered a cost. As 3M execs see it, everything coming out of a plant is a product, or a by-product (which can be reused or sold), or waste. Why, they ask, should there be any waste?" This is a policy that every company needs to start emulating (Penfield, 2007).

2.5.4. Corporate Social Responsibilities

Formed back in 2004, the Centre for Responsible Business is one of the hubs in expertise in Corporate Social Responsibility and longest standing centre for business responsibilities in United Arab Emirates. Providing research, training, assessment, certification, programs, events, and advisory services covers all aspects of Corporate Social Responsibility. The avowed mission of the organisation is "To raise the level of awareness, and encourage standards of good practice in organisational ethics, corporate responsibility and governance through the provision of research, training, standard certification and advisory work for Dubai Chamber members and stakeholders" (Rettab and Ben Brik, 2008)

This organisation (Dubai Chamber) aims to leverage every opportunity for fostering institutional integrity across the organisations and sectors. They will also indulge in innovations by embracing creative thinking and constantly striving to build productive partnership and solidarity supporting every initiative taken by local stakeholders in fulfilment of the mission. Vision of the

organisation is “To be the leading centre of expertise in Business Ethics and Corporate Social responsibility in Dubai, positively impacting Dubai Chamber members and stakeholders through the provision of knowledge resources and value added services that enable them to develop global business standards of integrity” (Rettab and Ben Brik, 2008)

Corporate Social Responsibility is the continuing commitment by any business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large (Holme et al, 2000; Dahlsrud, 2006). Corporate Social Responsibility is being used to describe how companies impact and affect the lives of people. Protecting the environment and preserving our resources is just another way of boosting the level of Corporate Social Responsibility in today’s economy. Ethically, protecting the environment and preserving our resources is the right thing to do, and a lot of companies these days use their values to evaluate their role in society (Bansal et al, 2000). To achieve the position of corporation reformation for environmental sustainability, the company will need to change their processes and how they consult and advise their clients (Hoffman et al, 1990; Shrivastava, 1995).

Most of the people are now quite familiar with the concept of Corporate Social Responsibility in some form or other. In the process they are developing strategies like good corporate governance and “corporate responsibilities”. A company has to be responsible not only for its financial performances but also its social and environmental performances.

Corporate Social Responsibility is also closely related to socially responsible procurement or how to best achieve good social and environmental performance in the supply chain. Most of the organisations are now starting to understand the importance of these environmental issues.

The Dubai Ethics Resource Centre formed in 2004 helps organisations apply reasonable business practices that can enhance their performances and competitive advantages through raising awareness and providing support and advice about the corporate social responsibilities.

2.5.5. Cost Reduction

There is no easy way to quantify the cost of going green. According to Frota Net et al (2008) only a limited number of initiatives for environmentally friendly production have proved to be profitable. Walley and Whitehead (1994) suggests that substantial improvement in the environment is only possible with substantial investments that brings no or negative financial returns. The adoption of cleaner solutions is generally bounded by an increase in costs. Companies should look at the cost of sustainability initiatives as an investment and should look for good trade-offs between environmental impact and costs. The Return on Investment (ROI) of going green can be more sales, increased market share, enhanced visibility, happier employees, and a better brand. Many companies are not yet able to quantify the costs that could be avoided or would arise due to a switch to a green supply chain approach, nor are they able to determine how additional costs could be funded (Straube and Borkowski, 2009).

Using Environmental Supply Chain to cut costs can be a major competitive advantage, especially in the current economic situation in the United Arab Emirates. Welford (1998) presents an overview of potential cost savings due to environmental management. Reduction of costs will occur from the elimination of waste. Any pollution essentially points to the fact that there is inefficiency as well as an increase in costs. All kinds of wastes are potentially raw materials, and a decrease in waste generation or energy consumptions will mean there is a decrease in raw materials and will result in decrease in costs and environmental impact. Environmental supply chain management is a concept that is extended to “closing the supply chain loop”. And the products or materials that are not used or returned can be manufactured and resold as green products. Organisations can potentially see this as a revenue generator or potential profit.

When supply chains start producing wastes, they also increase their costs and thus when the waste production is eliminated it reduces costs. Such costs include both tangible and intangible costs like the quality of life of the wastes. Across the supply chains of the organisations these costs could be significant in volume and extent. Indirect costs to society, which may be internalized through taxes, fines and penalties, would also be lessened (Porter and Van der Linde, 1995).

GE now has an "E-comagination program where they are focused on growing their revenue stream from environmentally friendly products to the tune of 20 billion dollars by 2010." They recognize the opportunity associated with saving the environment. Many utility companies are offering customers

environmentally produced power and charging a premium for that offering. Some groceries for example in the UAE “Organic Café” are able to charge a higher price on organic food because people are willing to pay a premium for food grown organically. Using an environmental or green supply chain management system can help save cost by not having to dispose of harmful by-products, reducing obsolescence, decreasing the amount of money spent on scrap and the resources spent on adhering to regulatory issues. Several companies have developed new revenue sources on the by-products they used to call waste. Many companies are using environmental supply chain management as a competitive advantage to grow market share within their industry (Penfield, 2007).

Unilever North Africa and Middle East have also recognized the importance of environmental, social and financial sustainability, by launching an environmental strategy in Dubai that would save the amount of wood used by Lipton (one of their premium tea brand), while minimizing its shipping costs by achieving greater load ability per container, expecting cost savings of approximately 10 to 20 percent.

When every enterprise will start thinking on these lines, it would have major effect on the land fill and environmental problems that are being faced with today, Companies today are mostly focusing on their indirect purchases like packaging and transportation in order to reduce the environmental issues. In fact throughout the world the commercial organisations are trying to reduce the use

of polythene and such other products having impact on the environmental issues. These are also economic to a large extent.

"Filling your trucks as full as possible. Dell has upped its average truckload from 18,000 to 22,000 pounds and worked with UPS to optimize delivery strategies. 3M developed an innovative system to install adjustable decks in trucks" (Penfield, 2007).

"Placing pallets on two levels allowed one 3M facility to reduce the number of daily truckloads by 40 percent and allowed them to save \$110,000 per year" (Penfield, 2007).

"Pepsi-Cola saved USD 44 million by switching from corrugated to reusable plastic shipping containers for one litre and 20-ounce bottles, conserving million pounds of corrugated material" (Penfield, 2007).

"McDonald's reduced the weight, volume, and environmental impact of its packaging materials and explores new packaging alternatives. The company conserved 3,200 tons of boxboard containers and saved \$3.6 million" (Penfield, 2007).

2.5.6. Environmental Collaboration With Suppliers

When integrating Suppliers and Environmental Management Processes organisations must enforce suppliers and customers to meet and exchange information, this could even lead to exceeding the environmental expectations of

their customers and their governments. Environmental collaboration would involve customer-supplier relations. And this type of relations is very important in the strategies of organisations and especially when it comes to environmental supply chain management as purchasing strategies for environmental performance are usually the first step in developing an environmental supply chain management (Handfield et al., 1997; Hall, 2000). Green, et al (1996) using case studies found that customers play a big role in influencing environmental improvement than suppliers. Klassen and Vachon (2008) went to discuss environmental collaboration in detail, as the direct involvement of an organisation with its suppliers or customers to jointly develop environmental solutions. In situations where there is environmental collaboration there will be an exchange of technical information, new product samples, best practices, updates, etc. and requires both supplier and customer to learn about each other's operations in order to plan together the surest way to reduce environmental impact.

When selecting a supplier to deliver a product, you are basically selecting the product and including with it all the wastes and emissions that were created during the production of the product, during the use of the product until the end-of-life of the product. Hence it is very important there is some collaboration between all entities in the supply chain life cycle, i.e. from the raw material extraction to final disposal. It is not enough to have information on the environmental performance of the first tier suppliers; it is also necessary to get information from their suppliers and sub-suppliers. Let's take an example from Hadfield et al. (2005) where one of the solutions to keep environmental

performance through out the supply chain life-cycle, is using the environmental performance as an order qualifier and making sure that the suppliers bring it forward to their suppliers during the procurement decisions.

There are also cases where the manufacturers are the ones who help the suppliers to improve their environmental performance; and some of these cases have already been discussed and analysed by Handfield et al. (1997, 2005). And in these cases it is mostly manufacturers who are large companies helping the small and medium sized suppliers. Hall (2000) has also documented that some suppliers lack incentives to improve their environmental performance, and if a buying company is not able to motivate their suppliers to improve, they must be able to force them.

Sometime the companies within the supply chain have the same understanding of the market; so the suppliers will probably have the same interest in focusing on environmental performance (Pagell and Krause, 2002).

Companies these days depend a lot on their suppliers for competitive success (Hahn et al. 1990; Lambert and Cooper 2000), especially the environmental performance of their suppliers. The suppliers must be considered when looking at environmental issues related to the project life cycle.

Purchasing and supply chain managers are in a critical position to influence the size of the overall environmental footprint of an organisation. Their influence on activities such as supplier selection and evaluation, supplier development, and

purchasing processes means they can have a major impact on the ability of the organisation to establish and maintain a competitive advantage. However, meeting this need will not be easy. Companies will face many challenges when trying to make suppliers an integral part of their environmental programs, including supplier resistance and constantly changing government regulations. Despite the difficulties, companies must commit themselves to improving the environmental performance of their supply chains. Only through a commitment of resources to environmental concerns can a company hope to achieve a competitive advantage (Walton et al, 1998).

Companies must proactively manage supply chain environmental initiatives and seek higher benchmarks rather than simple compliance with government regulations (Walton et al, 1998).

It is not that suppliers did not wish to reduce the environmental impacts that were the result of their operations and products. Rather they were finding themselves in a bewildering array of corporate environmental policies, specifications relating to purchase and other criteria for enhanced business relationships.

“There is no cookie-cutter approach to greening suppliers, as our recent conversations with companies found. Each has managed in its own way. At some companies, environmental procurement initiatives are comprehensive, with extensive performance criteria and evaluation processes given to all, or most, vendors. At others, the efforts are smaller and more targeted, focusing on

packaging, for example, on a specific type of emissions, or on only the largest suppliers.” (GreenBiz, 2003)

One of the major issues that are now plaguing most of the companies is the mode of action followed by the suppliers. Environmental supply chain management system is affected greatly by such actions. Companies are held responsible for protection of the environment today. But the question is whether companies would be able to sustain such types of exposure at any point of time. Companies are invariably taking up environmental audits and also implementing the rules of conduct to check the actions of their suppliers.

2.5.6.1. Supplier Selection

Companies are invariably taking up environmental audits and also implementing the rules of conduct to check the actions of their suppliers.

Walton et al (1998) have done several studies on how most organisations choose their suppliers and how this relationship is built. In most cases organisations would initially screen the suppliers with a pre-interview, which would basically measure their environmental performance and according to this measure of environmental performance, the suppliers are chosen. In some organisations a set of criteria are established and used in selecting key suppliers. Not only has Hewlett Packard (hp) with Supply chain standards used for selection of suppliers, but also they are also dedicated in investigating questionable practices and taking corrective actions when necessary and appropriate by using the Supply Chain Conformance.

EPA (2000) notifies that proactive management of supplier environmental performance, as practiced by Hewlett Packard, can lead to product and process simplification, more efficient resource utilization, product quality improvement, liability avoidance, and an enhanced leadership image.

2.6. Implementing Environmental Supply Chain

The question is how the organisations can develop business case that would value the environmental supply chain management system. However initial insights are meant basically to help the managers, business executives as well as the policy makers realize that the values associated with all these activities go beyond environmental improvements.

The implementation of an environmental supply chain management should start with commitment by the top management. Sensitization and participation of the all the employees on environmental issues is very important on the success of the project.

To really implement environmental / green supply chain management, there is a lot work to be done, and not only should the strategic assets view of environmental / green supply chain be established, but also establish organisation, cooperation mode and performance management system in the process of implementation (Zhou, 2009).

“Companies striving to reduce their environmental impacts by pushing eco-efficiency measures up the supply chain often find that this is much easier said than done. It’s certainly not a matter of merely handing down an edict about your environmental standards or specifications and expecting everyone to stand up and salute. Many suppliers would just as soon you take your business elsewhere” (Greenbiz, 2003)

“There are many activities that business organisations complete that can have environmentally sustainable implications. Many policy makers and business executives are coming to terms with these activities. The activities range from simple departmental and employee initiatives such as introducing more efficient lighting or recycling programs to relatively complex and integrated activities such as life cycle analysis, design for the environment and environmentally sustainable supply chain management (ESCM) programs. In this short essay I will focus on the more complex organisational activity, one that can possibly have the most profound influence on the environment, ESCM.” (Saris, 2009)

Unlike most other activities the environment supply chain management might be one of the complex internal activities but it also requires the initiatives and collaborations of external organisation collaborators. Such programs are neither simple nor they typically require significant resources for their design, implementation as well as management. They are not only multi-organisational but also multi-functional. An organisation would require the efforts of marketing, engineering, logistics and procurement and all these would be

additional requirements for the management groups that are entrusted with the tasks of managing supply capacity of any organisation.

2.6.1. Four Basic Steps In Implementing ESCM

That brings us to the most pertinent question in the entire discussion of this section is how would the companies develop sustainable supply chains. "The Lean and Green Supply Chain: A Practical Guide for Materials Managers and Supply Chain Managers to Reduce Costs and Improve Environmental Performance." By the United States Environmental Protection Agency (EPA) published in 2000, outlines an outstanding process of developing the systematic approach in implementation of the green supply chain management system and also gives examples of what other organisations have to do to increase their environmental performance in order to use environmental supply chain management, it states it is a four step decision making process. The first step is to identify environmental costs within your process or facility. The next step is to determine opportunities, which would yield significant cost savings and reduce environmental impact. The third step is to calculate the benefits of your proposed alternatives. The last step is to decide, implement and monitor your improvement solutions. If the environmental Supply chain is correctly implemented the benefits will become visible either in a short and long term.

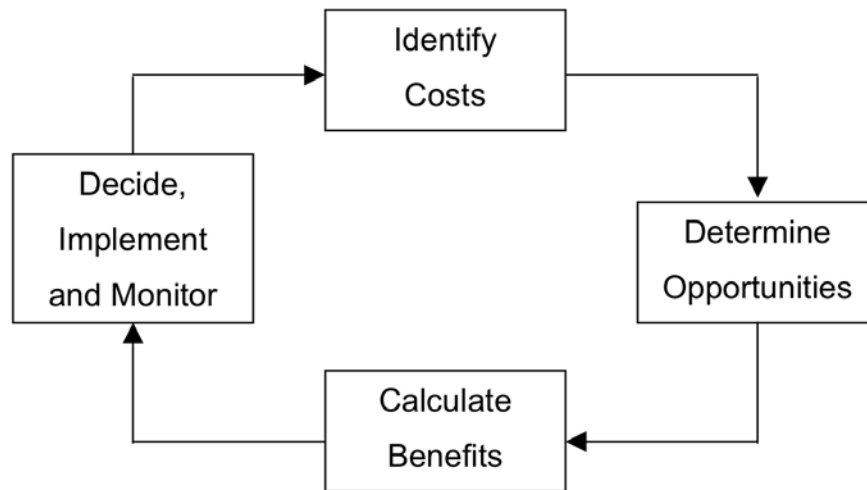


Figure 2.3. Four Basic Steps to implement Environmental Supply Chain Management

2.6.2. Implementing Sole Responsibility

Environmental supply chain management is not only one of the complex issues to be managed by the practitioners but also for the researchers in the field and they require the understanding of the theories as well as models from a number of disciplines. Business value basically means improving both the long term and short-term profitability of the organisation concerned. That is why some organisations have a separate employee who is made responsible for the environmental supply chain of the organisations; this will be further discussed in this research in **Section 4.7.4**.

Having a department that deals specifically with environmental issues is an important move for any institution and helps the management on their general progress on environmental issues. Customers are also part of a chain supply and should be brought on board on the journey towards a clean environment.

The company should provide its clients with environmentally sensitive products creating a strong environmental reputation (Carter and Warren, 2006).

2.6.3. Implementing Environmental Certification

Advantage of making savings in the supply chain is that it could generate unexpected revenue streams and those can be shared by the members who belong to the particular supply chain. Finally, for operating the process effectively and without any visible conflict among the stakeholders, organisations need to develop their “rights to do business.” The value-adding dimension is related to enhancing the reputation and legitimacy of the organisations that have environmental supply chain management in place and this can be done through certification, or involving themselves with several organisations that are dedicated to sustainability and environmental concerns. Industries or the companies that are considered to be socially irresponsible may have greater barriers and can experience difficulties while attempting to complete their business activities in multiple regions or difficulties while seeking to expand their organisational capacities in the current locations.

Environmental certification is a kind of standard setting by organisations, which are developed as specifications, rules or definitions for environmentally performance and in most cases certify those products that have met those standards. Using these organisations’ standards may be an efficient way for your facility to adopt environmental specifications without doing extensive product research yourselves. It can also open up new business opportunities with customers who are willing to work with only environmentally certified

organisations. It is also another way of education your staff internally about the ethics and how to help make better use of energy and resources, that can lead to a decrease in cost. ISO 14001 is an internationally recognized environmental management system (EMS) standard, providing a model for companies to follow to create and achieve their policy. Focusing on the issues that really matter, 'ISO 14001' is designed to help companies achieve consistent environmental regulatory compliance whilst embedding the concept of continuous improvements in environmental performance. For example TNT Express United Arab Emirates is one of only a handful of United Arab Emirates-based companies to achieve ISO 14001.

The use of international standards environmental management systems may improve companies' environmental performance. For example, an increasing number of companies are certifying their environmental management systems by ISO 14000 series standards. Supporters of ISO 14000 claim substantial operational, managerial, and competitive benefits for companies that adopt the international guidelines. Following a growing interest in corporate social responsibility, the International Organisation for Standardization (ISO) announced plans for development of the ISO 26000 guidance standard for social responsibility. Despite initial signals that ISO 26000 will be built on the intellectual and practical infrastructure of ISO 9000 and ISO 14000, the Advisory Group on Social Responsibility set a different direction: a guidance standard and not a specification standard against which conformity can be assessed.

Meeting the standards of different countries can be expensive. ISO 14000 can reduce this effort by providing one standard. ISO 14000 focuses on environmental management, auditing and performance measurements as well as parameters that include what is now known as a green labelling. Environmental certification is customer-driven. Some Customers insist on going for companies using standard certifications (Plait, 1998; Wikipedia, ISO 14000). Another certification in the building industry here in the United Arab Emirates is the LEED. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the U.S. Green Building Council (USGBC), provides a suite of standards for environmentally sustainable construction (Wikipedia, LEED).

2.7. Life Cycle Assessment (LCA)

Life Cycle Assessment (LCA) is defined as ‘compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle’ (ISO 14040, 2006). Compared to several other analytical tools (above), the scope of an LCA is to assess the potential environmental impacts of the inputs and outputs of a system, not only the flows as such. It is a comprehensive tool with a cradle-to-grave focus and the idea is that LCA applied to a product should make it possible to assess the overall environmental burdens, identify the ‘hot spots’ of the life cycle and predict the effects of any proposed improvement actions.

Nevertheless, no longer it is acceptable or cost-effective to consider only the local and immediate effects of products and process; it is now imperative to

analyse the entire life cycle effects of all products and process. Life cycle analysis of domestic appliances, for example, shows that a majority of total lifetime energy consumption occurs during use, rather than in product manufacturing or transport (Chang, 2001).

Life Cycle Assessment (LCA) is the main tool of the environmental or green supply chain management used in organisations to collect data on environmental issues to be used to build up supply chains that will improve environmental impacts of the supply chains (Wikipedia, Life Cycle Assessment). It is mainly used in comparing evaluation of product and process design aid and improvement of analysis. The Life Cycle Assessment works by compiling the inventory of the relevant inputs and outputs of a supply chain system, then evaluation of their potential environmental impacts and interpretation of the results with regard to the assessment. The Life Cycle Assessment yields different results depending on the set objectives that were used to develop it. Low energy consumption, waste generation and release of pollutants are also an important aspect of the Life Cycle Assessment. To achieve the objectives requires specific ways of integrating the Life Cycle Assessment into the supply chain. The Life Cycle Assessment helps the supply chains to develop improved risk management, brand image and enhanced quality. The Life Cycle Assessment has a limitation when it comes to dealing with recycle loops and divergent processes; this is because the principle behind the Life Cycle Assessment processes does not have a provision for the use of recycled products. Such processes with recycling and waste treatment processes require additional

extensions to the standard Life Cycle Assessment (Hagelaar and Van Der Vorst 2001).

The advantage of the Life Cycle Assessment is the fact that it allows for the establishment of inclusive baselines of information on a product's resource requirement. It is also easy to establish in a product's life cycle where the greatest impacts on environmental burdens can be arrived through. The major disadvantages of a Life Cycle Assessment are that, one; it is data hungry and therefore requires a lot of data sets to make it work. The Life Cycle Assessment has varying indices for different products leading to varied results even for the same product.

2.7.1. Data Envelopment Analysis

Data Envelopment Analysis (DEA) is another method, which compares the efficiency of a supply chain in relation to its competitors. This measure only takes into consideration direct output to the market but in the production there are some outputs in some intermediate processes that are used as input in the next processes. The Data Envelopment Analysis assumes a dynamic approach that takes into consideration both the input and output simultaneously generating sufficient information about a chain system. However the Data Envelopment Analysis is a data intensive system that requires a lot of data, which is not easy to acquire from a supply chain. Data Envelopment Analysis just like other deterministic models is bound to have statistical noise, which may be mistaken for inefficiency (Ondersteijn et al. 2008).

2.7.2. GreenSCOR: An Analytical Tool

LMI Government Consulting is a non-profit organisation committed to help organisations and its leaders to reach decisions that make a difference. They have helped in the implementation of SCOR as well as submitted several whitepapers of SCOR and GreenScor. Environmental managers have started using a life-cycle analysis (LCA) approach to managing environmental impacts. SCOR is a supply chain analysis tool used by many organisations as it breaks the supply chain down into discrete process elements, each with associated metrics and best practices. Managers can use these elements to evaluate and compare their operations and pinpoint areas for process improvements. The most effective way to ensure environmental analyses involve the entire supply chain, and simultaneously ensure supply chain analysis considers all environmental aspects, is to merge these two concepts. The result is Greensboro, a modification of the original SCOR model, and can help in improving environmental management performance, supply chain management performance and environmental supply chain initiatives (Cash and Wilkerson, 2003).

The Score Model was assessed to find out the impact each process had on the environment, See **Figure 2.4** and **Table 2.3** to view the type of impact on each impact point.

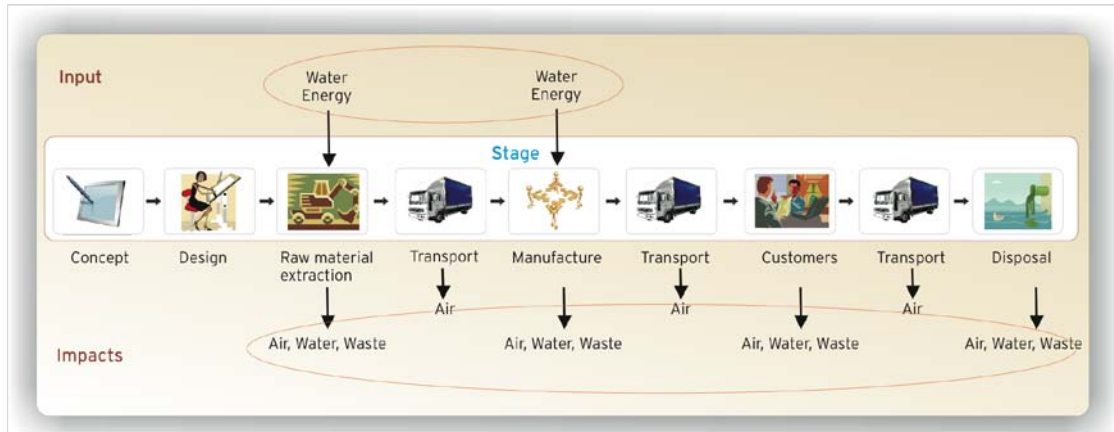


Figure 2.4. Environmental Impact at Each Stage of the Supply Chain
(Cognizant, 2008)

SCOR Process	Potential Impact
Plan	<ul style="list-style-type: none"> • Plan to minimize energy consumption and hazardous material usage • Plan the handling and storage of hazardous materials • Plan for the disposal of ordinary and hazardous waste • Plan compliance of all supply chain activities
Source	<ul style="list-style-type: none"> • Select suppliers with positive environmental records • Select materials with environmentally friendly content • Specify packaging requirements • Specify delivery requirements to minimize transportation and handling requirements
Make	<ul style="list-style-type: none"> • Schedule production to minimize energy consumption • Manage waste generated during the Make process • Manage emissions (air and water) from the Make process • In the case of 3M, eco-efficient manufacturing adoption can lead to more flexible plant configuration, enhanced productivity and strong influence on the evolving regulatory regime
Deliver	<ul style="list-style-type: none"> • Minimize use of packaging materials • Schedule shipments to minimize fuel consumption
Return	<ul style="list-style-type: none"> • Schedule transportation and aggregate shipments to minimize fuel consumption; prepare returns to prevent spills of hazardous materials (oils, fuels, etc.) from damaged products • “End-of-life” product disposition issues, as practiced by Xerox in its photocopier business, can lead to diminished waste liability, reduced cost of material, improved asset utilization, and a strengthened linkage with customers.

Table 2.3. SCOR Process Environmental Impacts (Cash and Wilkerson, 2003).

2.8. Summary

The literature review revealed that the barriers to establish environmental supply chain management practices have internal and external sources. The main external sources are regulations, government compliances, customer requirements, competitors' dynamics, poor supplier commitment, and industry specific barriers. The main internal barriers include cost, unawareness of their supply chains, poor expertise in environmental supply chain management approaches and lack of commitment or legitimacy. The literature review also discusses the major steps taken to break into environmental supply chain management and use the different tools that can measure the environmental supply chain of a project or organisation.

This research unlike Dr. Rettab and Bin Breks (2008) will include all the Emirates of United Arab Emirates, taking these barriers into consideration to get a better understanding of the usage of environmental supply chain management in the whole of United Arab Emirates. This research also adds a new variable, which is the "Life cycle Assessment"; an example to this is "Greensboro" which is used to better analyse the environmental supply chain in organisation. This was not taken into consideration in the 2008 research by Dr. Rettab and Bin Brek, and this variable will give a better understanding to how well environmental supply chain management is used in organisations. Another aspect of this research understands how implementing sole responsibility to an individual or department can influence the project in terms of environmental concerns and its success to reduce negative environmental impacts.

CHAPTER III

Research Methodology

3.1. Introduction

This chapter presents the study's selected research methodology. The research methodology is influenced by the purpose of this study and is based on an assessment of the optimal strategy for responding to the research questions. The current chapter takes into consideration the purpose of the study, its aims and objectives (refer to **Section 1.4.2**), and presents the hypothesis, discusses the data collection and data analysis procedures.

The first task of research is to determine the nature of the evidence needed to confirm or reject the stated hypothesis and secondly to design methods to discover and measure the evidence (Cooper and Schindler, 2003).

The research uses both qualitative and quantitative methods, because both primary and secondary data will be collected and analysed to give both numerical and hypothetical results.

The major difference between Dr. Rettab and Dr. Brek is that their research only took one Emirate into consideration (Dubai) and this study, takes all Seven Emirates in the United Arab Emirates into consideration and all industry types,

as well as adding a new variable “Life Cycle Assessment”, and a new tool (SPSS) to help better analyse the data, and allow organization to enhance their use of environmental supply chain management, hence achieving a high level of project success rate.

3.2. Research Hypotheses

There are two main hypotheses that this research will try investigate. These are discussed in the following sections and are in line with the objectives of the research study. Both hypotheses 2 and 3 are again divided into three sections, which are discussed further in the **Section 4.5.1**.

3.2.1. Hypothesis 1

The key to increasing the use of environmental supply chain management in organisations all over the United Arab Emirates is by using the key drivers (discussed in **Section 2.2**), of environmental supply chain management to raise awareness and spread their expertise and knowledge to other organisations.

3.2.2. Hypothesis 2

The key to organizations harvesting the best of environmental supply chain management, is integrating the life cycle perspective in overall management.

3.2.3. Hypothesis 3

The key to organisations benefiting from environmental supply chain management is appointing a separate individual or department to manage the environmental supply chain.

3.3. Sampling

The sampling process can be divided into five different and sequential stages, according to Diamantopoulos and Schlegelmilch (2002). These are in order of sequence: defining the sample population, specifying the sampling frame, selection of the sampling method, determining the sample size and drawing the sample (sample selection) in order to collect the data. The sections below give a detailed overview of the sampling process for this research.

a) Population Definition

The research universe for any research investigation consists of population units, analysis units and population boundaries (Cooper and Schindler, 2003). The application population units for this research investigation consist of organisations, specifically organisation in the United Arab Emirates, within the emirates Dubai, Abu Dhabi, Ajman, Sharjah, Fujairah, Umm Al Quwain, and Ras Al Khaimah. Industries of all types were taken into consideration including manufacturing, real estate, construction, trading and repairing services, hotels and restaurants, education, real estate and transport, storage and communication.

The questionnaires were electronically distributed to organisations randomly chosen using the simple random sampling method (See **Table 3.1.**), from the United Arab Emirates Business Directory (<http://www.uaebusinessdirectory.com>). In total 175 questionnaires were emailed (25 organisations were chosen randomly from each emirate) and

with only 74 respondents the response rate is 42.3%. The time constraints necessitated finding only a statistically sound sample instead of attempting a record-breaking response rate.

b) Sample Frame

The sampling frame is closely related to the population/universe being studied since it lists the elements from which the sample is actually drawn (Cooper and Schindler, 2003). However sampling means that certain population elements will be excluded from the sample, which leads to sampling error (Diamantopoulos and Schlegelmilch, 2002). Since the entire sample frame may be inaccurate or include elements beyond the parameters of interest, the sample has to be drawn according to predefined units, analysis units and population boundaries (Cooper and Schindler, 2003).

The sampling frame used for this research:

1. Organizations with license to trade in the United Arab Emirates
2. Organizations with company email addresses
3. Organizations in the following industries:
 - a. Education,
 - b. Transport, Storage and Communication,
 - c. Trading and Repairing Services
 - d. Real Estate
 - e. Construction
 - f. Hotels and Restaurants
 - g. Manufacturers

The sample selected out of the population universe allows the collection of data within the parameters of interest and these sample statistics are used as estimators of the population parameters of business organisations' in United Arab Emirates (Cooper and Schindler, 2003) The parameters of interest are discussed further in the section dealing with the research instrument (questionnaire) being applied and the methods of analysis, where the data collected are classified according to their meaning, their source and their time dimension based on their measurement properties (Diamantopoulos and Schlegelmilch, 2002).

c) Data Sampling Method

The sampling method selected for use in this investigation is the simple random sampling method. A brief description of the various types of methods is listed in **Table 3.1** showing the advantages and disadvantages of each.

Probability Sampling Designs			
Sampling Type	Description	Advantages	Disadvantages
Simple random	Each population element has an equal chance of being selected.	Easy to implement with random digit dialling.	Uses larger sample sizes. Is expensive. Requires a listing of population elements
Systematic	Selects an element at the start randomly and thereafter selects every k th element.	Simple to design. Easy to determine sampling distribution of means or proportion. Less expensive than simple random sampling type.	Periodicity within the population may skew the sample and results.
Stratified	Divides the population into subpopulations or strata and uses simple random on each.	Researcher controls sample size in strata. Increases statistical efficiency. Provides data to represent and analyse subgroups.	Increased error results if subgroups are selected at different rates. Is expensive.
Cluster	Population is divided into internally heterogeneous subgroups.	Provides an unbiased estimate of population parameters if properly done. Easy to do without a population list.	Often lower statistical efficiency due to subgroups being more homogeneous than heterogeneous.
Double sampling	Process includes collecting data from a sample using a previously defined technique, and then selecting a subsample based on information found.	May reduce costs if first stage results in enough data to stratify or cluster the population.	Increased costs if indiscriminately used.
Convenience	Researchers or field workers choose whomever they find.	Normally the cheapest and easiest to conduct. Useful in the early stages of exploratory research.	Considered the least reliable design. Researcher has no controls to ensure precision.
Purposive Judgment sampling	Sample conforms to certain criteria. Researcher selects respondents on a particular criterion.	This method can save costs and is useful at the exploratory levels	
Purposive Quota sampling	Certain relevant characteristics describe the dimension of the sample.	Can be used to improve representativeness and precision control	Cannot give the assurance of representativeness of the specific variables being studied. Has some danger of systematic bias.

Table 3.1. Comparison of probability and non-probability sampling designs (Cooper and Schindler, 2003; Diamantopoulos and Schlegelmilch, 2002)

d) Sample Size

The nature of this research study necessitates restricting the number of variables and respondents investigated in order to save costs and restrict the scope of the research to a realistic and practical time frame (Cooper and Schindler, 2003). Some key statistical considerations in determining the sample size include: the degree of variability in the population, the desired degree of precision required and the desired degree of confidence associated with any estimates made (Diamantopoulos and Schlegelmilch, 2002). As the sample size increases, the sampling error decreases (Diamantopoulos and Schlegelmilch, 2002), which means that the results based on the sample would be not as different as that obtained when the whole population would have been studied.

According to Statsoft (2007) the rule of thumb is for a sample size to be more than 50 in order to rule out serious biases and that for sample sizes greater than 100, the researcher should not be too concerned about normality assumptions. For a frequency distribution of data to be considered normal, it must have a mean of zero and a standard deviation of one.

The aim of collecting questionnaires is to make the sample size significantly large in order to have sub-samples (or groups) of respondents to compare to each other when in the statistical analysis phase

If the population were more heterogeneous, a larger sample size would be required to capture the diversity of the population (Diamantopoulos and

Schlegelmilch, 2002). In this research investigation 175 questionnaires were distributed to potential respondents via electronic email with the link to the survey and 74 usable questionnaires were returned. Three questionnaires were incomplete hence could not be used for the research.

e) **Sample Selection**

According to Cooper and Schindler (2003) and Diamantopoulos and Schlegelmilch (2002) the unrestricted simple random sample is the simplest form of probability sampling, which allows each population element a known and equal chance of being selected. By selecting a random sample, it allows the use of known probability values to be utilized for point estimates or confidence intervals in the statistical analysis of variables (Gujarati, 2003) that follows the empirical collection of data.

A good sample, according to Diamantopoulos and Schlegelmilch (2002) would have the following characteristics:

- It must strive to be accurate: which means there should be an absence of bias.
- It must provide a precise estimate: therefore the sampling error must be known or measurable.

The sample size is one determinant of the methods of statistical analyses to be done on the data collected, but to find a sample larger than 175 would become too costly and time consuming in managing responses. It is also necessary to examine the measurement characteristics of the sample

discussed later, since this also influences the statistical analyses conducted. (Diamantopoulos and Schlegelmilch, 2002).

3.4. Data Collection

Data collection within the applied sciences differs from the natural sciences where experiments are conducted under controlled circumstances. In applied sciences the communication approach involves surveying people and recording their responses (Cooper and Schindler, 2003). The data collecting was done by the survey method, which was implemented by the e-mailing of a structured questionnaire to obtain data from organisation regarding the use of environmental supply chain management in managing project within their organisations.

The research method employed in this study will however involve the collation of data collected using a free online survey and questionnaire tool called the “Survey Monkey”, which allowed a link to the survey to be emailed to all the organisations that were to take part and also allowed to easily analyse the results. The link to the survey was sent to over 175 small, medium and large organisations, 25 organisations were selected for every Emirate. Since all companies used in this survey and analysis are in the United Arab Emirates, this method proves to be cheaper than sending out postal surveys and less time consuming than conducting telephone interviews.

Qualitative studies may employ indirect methods such as experience surveys, focus groups or in-depth interviews (where the third person is used) to measure

the respondents' attitudes and motivations towards certain things or activities (Zikmund, 2003). Due to time and budgetary constraints no personal interviews were conducted with the respondents by either the researcher or by field workers, but the electronic medium of distribution was meant to increase the geographic reach of the investigation according to the benefits derived in e-commerce research studies (Cooper and Schindler, 2003; Report and Jaworski, 2003).

The online questionnaire is also an attempt to appear more business oriented to the respondents and provided access to the computer-literate respondents with access to internet connection, since computer literacy must be assumed applicable for the respondents (Cooper and Schindler, 2003). The value of the online questionnaire that was sent as a link by electronic mail is to be consistent with the premise that most organisations are familiar with e-mail as the modern, everyday form of business communication (World Wide Worx, 2006), however the online survey method was chosen after due consideration of the following:

- Computer delivered e-mail questionnaires meant that it could be forwarded easily to a relevant respondent in the case of it reaching the unintended person.
- No interviewer assistance was required in order to complete the e-questionnaire.
- The interviewer presence was not required as would have been the case for personal or telephonic data collection methods.
- The risk was eliminated of respondents being “unwilling to talk” to people

such a field worker, as would have applied to personal and telephonic interviews.

- There was no need for repeated call backs when the respondents were not reached.
- Data collection is immediate. An online forum allows responses to be received more quickly from subjects
- The e-mail is the lowest cost option as compared to the other two (all from Cooper and Schindler, 2003). This method is also cheaper to administer, as there are no costs associated with purchasing paper or other materials for printing. Postage costs are also mitigated. Also making this the most environmental friendly way of collecting information.
- Since data is collected into a central database, the time for analysis is subsequently reduced.
- It is easier to correct errors on an online questionnaire, since the administrator does not have to reprint all the questionnaires for distribution
- Confidential and non-threatening to the respondent
- There will be no need for manual data coding of the completed questionnaires by the researcher.

The first step towards the primary research collection was to look for a website that provides a tool to design questionnaires as well as have a reporting system that would allow the data to be analysed in a timely manner. Online questionnaires have become the most popular way of collecting information. Once the survey is created and tested, it is ready to be sent out to organisations. The best way to do this is sent the link in an electronic mail, including an

introductory letter to the organisations targeted. The introductory letter would confirm the reason behind the email, hence not mistaken as spamming.

To reduce the risk of having the same organisation fill in the survey more than once, the survey was designed to allow one survey to be filled per IP address. An **Internet Protocol (IP) address** is a numerical label that is assigned to devices participating in a computer network that uses the Internet Protocol for communication between its nodes. An IP address serves two principal functions: host or network interface identification and location addressing (Wikipedia, IP Address). The IP Address would be unique for every office Internet line, with a larger population of the organisations having IP Addresses that would be renewed after a few days.

If the response rate is too low by the second week a follow up electronic mail is sent out. In some cases a telephonic follow up was done, so as to have the completed questionnaires filled before the due date. The deadline for completing the questionnaire needed to fit into the time constraints of the research project and therefore could not be completed by the respondent later than a month after receipt. There is no need for manual coding of the completed questionnaire as the online questionnaire tool automatically does this as the questionnaire is filled.

The nature of the data collected is both qualitative and quantitative. The value of applying both the qualitative and the quantitative approaches meant that the study will go beyond exposition, to develop an argument to explain the findings

as recommended by Cooper and Schindler (2003).

3.4.1. Questionnaire Design

The questionnaire of research instrument was compiled by adapting questions used in the “Green Supply Chain in Dubai” research by Dr. Beliad Rettab and Dr Anis Brik, which were in turn adapted from Zhu et al (2008). The reason behind this adaptation is to allow investigating and comparing their findings and the researcher’s findings. The limitation of Dr. Rettab and Dr. Brik’s questionnaire was that it was used to collect data only in the Dubai emirate, and a new variable needed to be added, i.e. “Life Cycle Assessment”.

The questionnaire has three sub-sections. The first pertains to information about the organisations and their business, and the second investigates their use or lack of use of the environmental supply chain management system when managing projects within their organisations.

Section 1. Background Information

This section collected information on the organisations business, the type of business they participate in and the number of employees the organisation has currently employed, and the location the organisation.

Section 2. Use of Environmental Supply Chain Management

This section collects information of organisations that use or do not use the environmental supply chain management when managing projects within their organisations, and the reasons behind it. It also allows collecting information

about the status of companies that are using the environmental supply chain management and the tools they use to manage the environmental supply chain.

The sub-sections of the research questionnaire can be translated into the research objectives of the study, which in turn can be matched to the research constructs as listed in **Table 3.2** below. A more in depth discussion follows on the questionnaire methods of response.

Research Objectives	Research Construct
Identify the emirate that is leading the way with environmental supply chain management	EMIRATE
Identify the key drivers that drive an organisation to use ESCM in the united Arab emirates	DRIVERS
Identifying the relation between organisations that use “Life Cycle Assessment”, and their success rate.	LCA
Identifying the relation between organisations that have a senior manager or department whose only role is to manage the environmental supply chain management and, the their success rate	SM

Table 3.2. Research objectives and constructs for the study

3.4.2. Nature Of Data Collected In Questionnaires

In order to move beyond qualitative data gathering to meet the objectives set out in **Table 3.2** the nature of the data can determine whether it can be quantitatively as well. There are four different data levels or measurement scale types which in ascending form (from the lowest to the highest level) are called nominal, ordinal, interval or ratio type data. These influence the methods of response for questionnaire items.

a. Nominal Data

Nominal data serves only to identify (e.g. male or female) and can therefore only be counted (Diamantopoulos and Schlegelmilch, 2002)

b. Ordinal Data

Ordinal data can provide an ordered relationship (e.g. from bad to worse) but is limited in being unable to explain how much better or worse the respondent feels about technologies.

c. Interval Data

Interval data such as temperature readings are characterized by the equality of the intervals and permit inference being made as to the extent of differences between “bad” and “worse”.

d. Ratio Data

Interval data lack a true zero point, which is characteristic of ratio data according to Diamantopoulos and Schlegelmilch (2002) and Cooper and Schindler (2003). An example of ratio data would be age in years, which requires a true zero since no person or computer system can have negative numbers of years in existence (Cooper and Schindler, 2003).

Besides the reality that the data being collected by the research instrument can have different measuring levels as explained by Cooper and Schindler (2003); But Sigmund (2003) concurs that the individual questions on the research instrument can also be formatted according to different scaling formats. Scale formats are useful when trying to measure more abstract constructs (such as attitudes) for which no standardized scale exists (Cooper and Schindler, 2003). The custom designed questionnaire used in this study therefore had to provide the respondents with different response types for example to choose out of a checklist; choose between a dichotomy (yes or no responses only); or to rank options directly by selecting a specific point on the scale (Cooper and Schindler, 2003, Diamantopoulos and Schlegelmilch, 2002).

The choice of selecting different scaling formats depends on the type of research problem, the respondent groups and the construct characteristics to be measured. The questionnaire was used to link the hypothesis and individual questions in a structure according to the aims determined by the four research objectives discussed above. **Table 3.2** can now be expanded to include the level of data measured and illustrate how questions have been linked to different objectives as illustrated in **Table 3.3** on the following page.

Research Objectives	Research Construct	Question Reference	Data Level Type	Description of variables
Identify the emirate that is leading the way with environmental supply chain management	EMIRATE	Q1, Q2, Q3, Q4, Q4,	Q1- nominal Q2 – nominal Q3 – ratio Q4 - ordinal	Q1- size Q2 – location Q3 – market Q4 – consideration
Identify the key drivers that drive an organisation to use ESCM in the united Arab emirates	DRIVERS	Q5 Q6	Q5 – nominal Q6 - nominal	Q9 – different reasons for using ESCM Q10 – different reasons against ESCM
Identifying the relation between organisations that use “Life Cycle Assessment”, and their success rate.	LCA	Q9 Q8	Q9 – nominal Q8 - nominal	Q9 – LCA Q8 – Success Rate
Identifying the relation between organisations that have a senior manager or department whose only role is to manage the environmental supply chain management and, the their success rate	SM	Q7 Q8	Q6 – nominal Q8 - nominal	Q6 – SM Q8 – Success Rate

Table 3.3. Link of objectives, constructs, questions, data levels and variables

3.4.3. Pre- Testing Questionnaire

The draft questionnaire was pre-tested by administering it for completion by respondents similar to those included in the research study. The data collection process was piloted in order to prevent any misunderstandings over the electronic telecommunications medium and in order to make any changes necessary before it was administered to the research sample (Cooper and Schindler, 2003, Frazer and Lawley, 2000). Pre-testing was needed since the respondents' answers from the effective sample will be used to test the hypothesis listed above (Cooper and Schindler, 2003) and to measure the strength of the relationship between the variables being measured.

However, no amount of pre-testing of a questionnaire can eliminate the measurement error that will creep in whenever any measurement instrument is being applied. Measurement error is the difference between the observed score, which the respondents complete on the questionnaire and the true score (i.e. the accurate reflection of the characteristics being measured) and this indicates measurement quality (Diamantopoulos and Schlegelmilch, 2002). Measurement quality means that the researcher used a valid questionnaire on which to base the statistical analysis' findings and conclusions, which brings the discussion to the topic of sensitivity, validity and reliability, in an attempt by the researcher to minimize measurement error.

3.5. Data Analysis

The data analysis objectives must be in line with the reason why the research is being done (i.e. the research objectives) and therefore the process of setting the current data analysis objectives can be described in terms of the research investigation's content and focus (Diamantopoulos and Schlegelmilch, 2002).

3.5.1. Data Analysis Content

The content refers to the variable(s) that were selected for inclusion into the research study. Broadly speaking, the variables relate to the sections of enquiry as discussed before under the questionnaire design section of this chapter, however the research instrument can be viewed in the annexure of this document to see all 43 variables used in the investigation.

3.5.2. Data Analysis Focus

Focus refers to whether the research aim is:

- To describe (i.e. to paint a summary picture)
- To estimate (which is to use the information obtained on the sample to make an informed guess based on incomplete information)
- To make inferences, i.e. decide whether to hypothesize, which is to test

propositions regarding the variable(s) of interest, according to Diamantopoulos and Schlegelmilch (2002).

The data analysis focus will be explained in more detail in the **Section 4.2**, to demonstrate that the researcher firstly used a descriptive focus (using pie chart, bar charts to summarize the findings or the data collected), followed by an estimation focus (using the data collected by Dr. Rettab and Dr. Bin Brik's Research and comparing it with this research) and ending with a hypothesis-testing focus using a reliability test and correlation analysis. When testing hypotheses, the sampling error can be addressed by using significance tests, which are statistical techniques that help the researcher to decide if sample results are likely to hold in the population as well (Diamantopoulos and Schlegelmilch, 2002). The next page shows the steps that need to be taken to test a hypothesis.

Steps to be taken	Reasons why and explanations
State the null hypothesis, H_0 and the alternative H_a .	H_0 and H_a are non-directional, which means that no significant differences are anticipated. The notation commonly used to represent the null hypothesis is H_0 , and that of the alternative hypothesis H_a
Choose the statistical test to be done	Pearson Correlation
Select the level of significance (α = the Greek letter alpha).	Two-tailed tests are done at the 5% level of significance in this study.
Compute the calculated difference value.	After data collection, coding and input, the SPSS program can calculate test values.
Obtain the critical test value	For example the correlation test value may be more or less than the significance value.
Interpret the test	What are the implications of the results: significant or non-significant?

Table 3.4. Steps for Hypothesis testing (Diamantopoulos and Schlegelmilch, 2002).

3.6. Reliability of Data

Reliability relates to the truthful replicable consistency of the measure(s) while validity is concerned with how well the concept is defined by the measure(s) (Statsoft, 2007). Reliability pertains to the representation of the results of the

specific sample for the entire population from which it is drawn. In other words, reliability indicates how probable it is that similar relations between variables would be found if other samples were drawn from the population. Cronbach's α (alpha) is a statistic used to measure reliability for a sample of examinees (Wikipedia, Cronbach's Alpha)

Sigmund (2003) sees reliability as applying to a measure that yields similar results over time and situations, which underpins the concepts of repeatability and internal consistency. This is in agreement with other definitions of reliability as the extent to which a variable or set of variables is consistent in what it is intended to measure (Statsoft, 2007) or is free from random error (Diamantopoulos and Schlegelmilch, 2002).

3.7. Correlation And Significance Test

In order to successfully conduct a correlation and significance test, it is important to understand the results. The values of the coefficient would range from -1 to 1. The sign of the correlation coefficient indicates the direction of the relationship (positive or negative). The absolute value of the correlation coefficient indicates the strength, with larger absolute values indicating stronger relationships. The correlation coefficients on the main diagonal are always 1, because each variable has a perfect positive linear relationship with itself (Field, 2009).

The significance of each correlation coefficient is also displayed in the correlation table. The significance level (or p-value) is the probability of

obtaining results as extreme as the one observed. If the significance level is very small (less than 0.05) then the correlation is significant and the two variables are linearly related. When the significance level is large (for example, 0.50) then the correlation is not significant; in this case the two variables are not linearly related (Field, 2009).

3.8. Conclusion

In order to conclude the discussion on the research methodology, a summary of the approach to the research study is provided here. As this chapter has argued, the research methodology that is most suited for this study is both quantitative and qualitative, which uses both primary and secondary data.

The research study involves investigating the possible barriers of environmental supply chain management in small, medium and large organisations in the United Arab Emirates, and investigates the best possible tool to use to utilize the environmental supply chain. Organisations were targeted by the distribution of an email to fill in an online questionnaire, in a survey method for data collection.

With a response rate of 42.3%, it means that 74 usable questionnaires were collected from respondents out of 150 questionnaires distributed over a calendar month period in end 2009. The data collected were coded and entered into the SPSS program and processed to obtain descriptive data with frequency distributions and where applicable. The Reliability, Correlation and Significance Test is done to test hypothesis two (2) and three (3)

This chapter briefly introduced the reader to only the relevant statistical concepts i.e. in particular the ones that were applied to the research data obtained from the investigation. It is necessary to be enlightened on the reasons why a particular stage or technique is applied in the research study analysis. The impact of the data patterns and interpretation of the findings follow in a more holistic discussion in the next chapter.

CHAPTER IV

Research Findings and Results Discussion

4.1. Introduction

The results of this study are based on a quantitative investigation of organisations in the United Arab Emirates, the usage of environmental supply chain management in these organisations, what are the key drivers that drive organisations to use environmental supply chain management systems, and how well organisations do when they introduce “Life Cycle Assessment” to the system and a separate department or individual to manage this department. The results are further investigated using SPSS application to find the relation between organisations that have a senior manager whose primary role includes environmental supply chain management and the organisations ability to expand to new markets, establish a competitive advantage and reduce logistics costs; and the relation between organisations that use “Life Cycle Assessment” and the organisations ability to expand to new markets, establish a competitive advantage and reduce logistics costs. These relationships would show if there is any importance of having a senior manager who will only be responsible for environmental supply chain management, and if there is any importance of using “Life Cycle Assessment” to measure environmental supply chain.

As mentions in **Section 3.3**, the sample in the study was of organisations in the United Arab Emirates; all Seven emirates were taken into consideration. This study is different from Dr. Rettab and Dr Ben Brik's study in 2008, where the study was only limited to organisations in Dubai, and the study was only used to raise awareness in regards to environmental supply chain management. The purpose of the study is to use the findings to derive a solution that will help increase the use of environmental supply chain management efficiently hence encourage standards of good practice in organisations ethics, corporate responsibility, and environmental responsibility. In order to satisfy this purpose, the study focused on primary and secondary data. The secondary data was collected from academic journals, books and in very few cases, and websites. The literature collected and reviewed environmental supply chain management and factors, which influence organisations to adopt this method to manage their supply chain. As for primary data, it was collected through an online questionnaire, sent via electronic mail to organisations in all Seven emirates. Completed and usable questionnaires from 74 respondents form the basis of the results of this chapter.

This chapter presents a summary of the findings, followed by a discussion section (**Section 4.7**) of the study's results as related to the statement of the problem, purpose of the research, and the research question.

4.2. Data Analysis Focus

This chapter presents the data analysis in three different sections

- a. **Descriptive:** This is where the focus is on the summary of the findings, there detailed diagrams that help describe and differentiate the data.
- b. **Estimation:** This section will compare the findings of Dr Rettab and Dr Bin Briks' research of "The Green Supply Chain In Dubai" with the "Dubai section of this research and estimate whether things have improved or not since 2008.
- c. **Hypothesize:** In this section a test is done to see if there is any relation between 4 variables, organisations that have a senior manager whose primary role includes environmental supply chain management and the organisations ability to expand to new markets, establish a competitive advantage and reduce logistics costs.

4.3. Descriptions

4.3.1. Sample

As earlier noted, the online questionnaires were distributed by electronic mail. The online questionnaire were easily available to the organisation representative as it was in a form of a web page, hence only an internet connection was required to complete the questionnaire, and instant data collection.

The researcher had distributed the website of the online questionnaire to 175 organisations, sent to twenty-five organisations for every Emirate. A period of 30 days was set for the completion of the questionnaires, after two weeks a reminder was sent regarding the questionnaires using electronic mail. At the end

of the month 77 respondents managed to complete the questionnaires. Three of them were rejected and excluded from the study because they were not complete. Therefore, only 74, respondents were drawn. As the researcher did not have any direct contact with the respondent and, therefore, could not communicate with them for the purpose of soliciting more responses, it was not possible to increase the sample size.

The results of the questionnaires will be presented below, and compared with results from Dr. Rettab and Dr. Bin Briks' (2008) study.

4.3.2. Organisations Studied

This section focuses on the organisations' description, main area or market of business and their location in the United Arab Emirates. This information was collected from the "Background Information" section on the online questionnaire.

4.3.3. Organisation's Location

There are 74 respondents who have fully completed the online questionnaires of which 16 out of 25 respondents were from Abu Dhabi out of which a higher percentage of the organisations responded were either medium (101 to 500 employees) or large (500 or more employees), same goes for Dubai with 19 out of 25 responds, 11 out of 25 responds were from Sharjah, 9 out of 25 responds were from Ajman, 8 out of 25 responds were from Ras Al Khaimah, 5 out of 25 responds were from Umm Al Quwain, and 6 out of 25 responds were from Fujairah. **Figure 4.1** shows the percentage of respondents who have completed

and not completed the online questionnaires from all Seven emirates, including a summary of the overall completed and incomplete questionnaires in the United Arab Emirates.

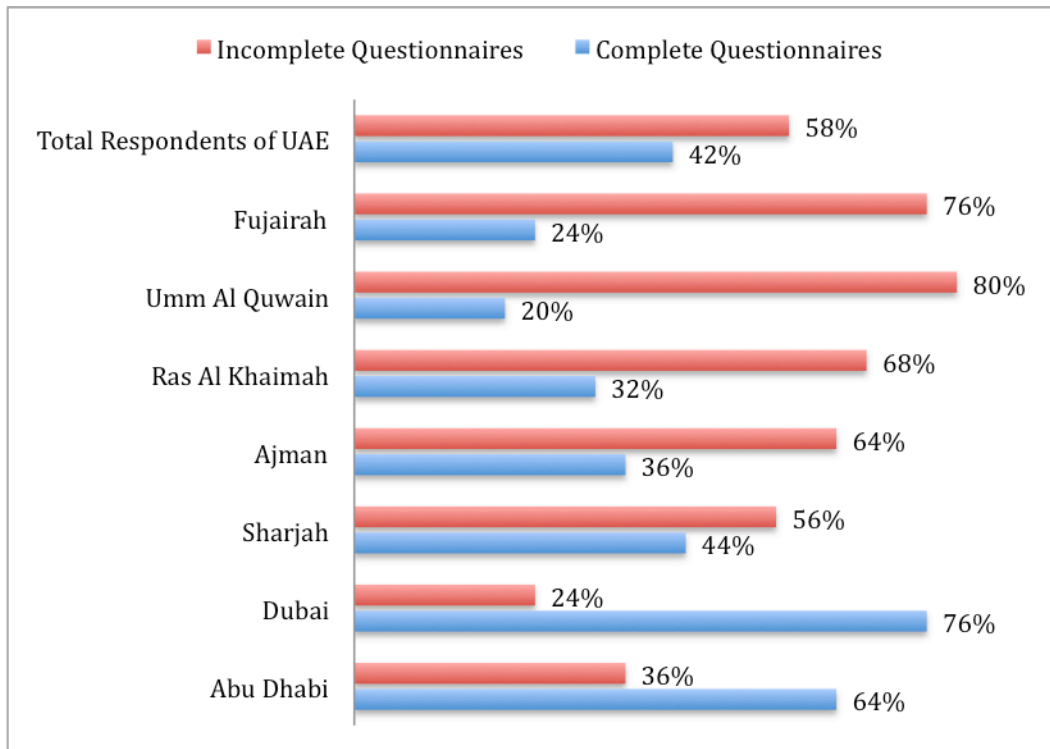


Figure 4.1. Percentage of Completed/Incomplete Respondents For Each Emirate

4.3.4. Market Sectors of Organisations Studied

The market sectors are divided into seven categories. Approximately thirty six (36%) percent of the respondents were from the trading and repairing services having the highest number of respondent and the second highest was from the real estate market with approximately twenty six (26%) percent response, and the education market had the least number of responses of approximately three percent (3%). **Figure 4.2** shows the summary respondents in the United Arab Emirates in their respective markets. Although the education market had the

least number of responses, **Figure 4.9** shows that it had a 100% response on markets that have already adopted environmental supply chain management.

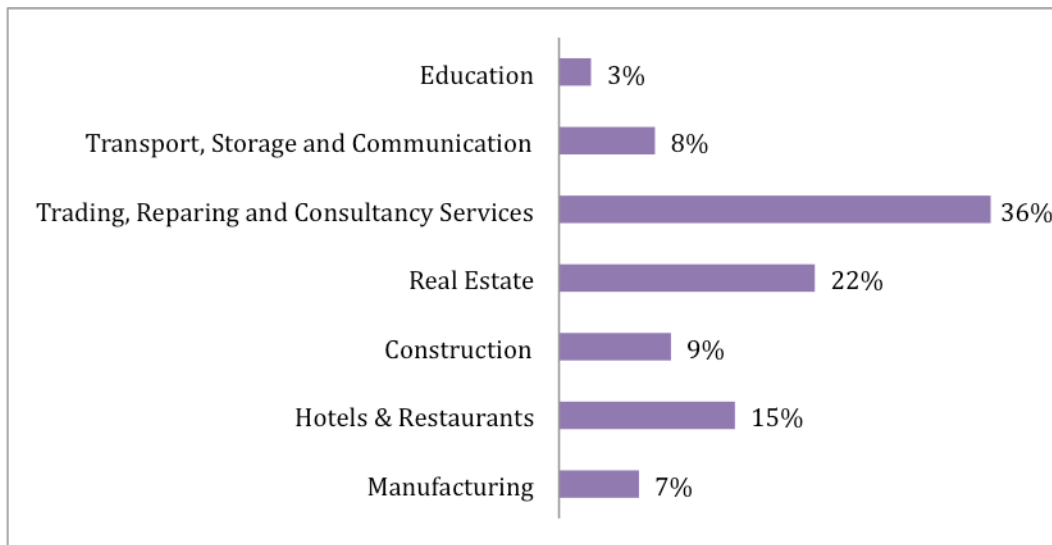


Figure 4.2. Percentage of Respondents of UAE In their Respective Markets

Figure 4.3 gives a more detailed view of the respondents from the Seven Emirates and the market they fall under. The Trading, Repairing and Consultancy Service market sector in Dubai has the highest number of respondents, approximately 24%. There was no response from:

- Education market in Fujairah, Ajman, Umm Al Quwain, Ras Al Khaimah and Sharjah.
- Manufacturing market in Fujairah, Ajman, Sharjah, Umm Al Quwain
- Construction market in Ajman, Fujairah, Umm Al Quwain, Ras Al Khaimah
- Transport, Storage and Communication market in Fujairah, Umm al Quwain, Ras Al Khaimah.

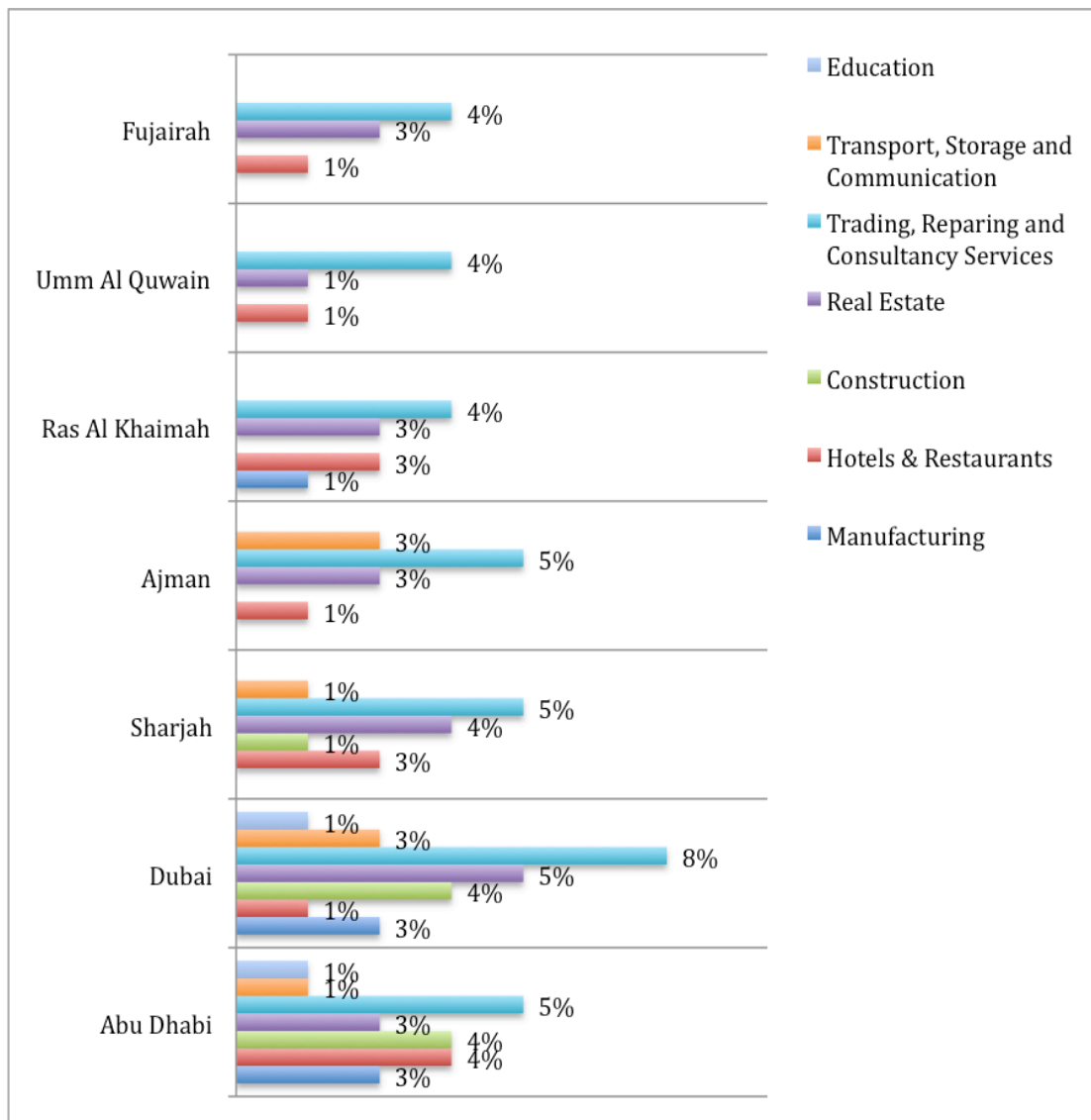


Figure 4.3. Percentage of Respondents In Their Respective Markets For Each Emirate

4.3.5. Size of Organisations Studied

Fujairah, Umm Al Quwain and Ras Al Khaimah, all have a higher percentage of small organisations of about 50 to 100 employees. The size of the organisations were divided into three where less than 101 is the lowest interval, less than 500 is the medium interval and more than 500 is the upper level. **Figure 4.4** shows the percentage of small, medium and large organisations of the 74 respondents that have responded to the online questionnaires from each Emirate.

- There were no responses from Large organisations in Fujairah, Umm Al Quwain and Ras Al Khaimah
- There were no responses from any Medium size organisations in Umm al Quwain.

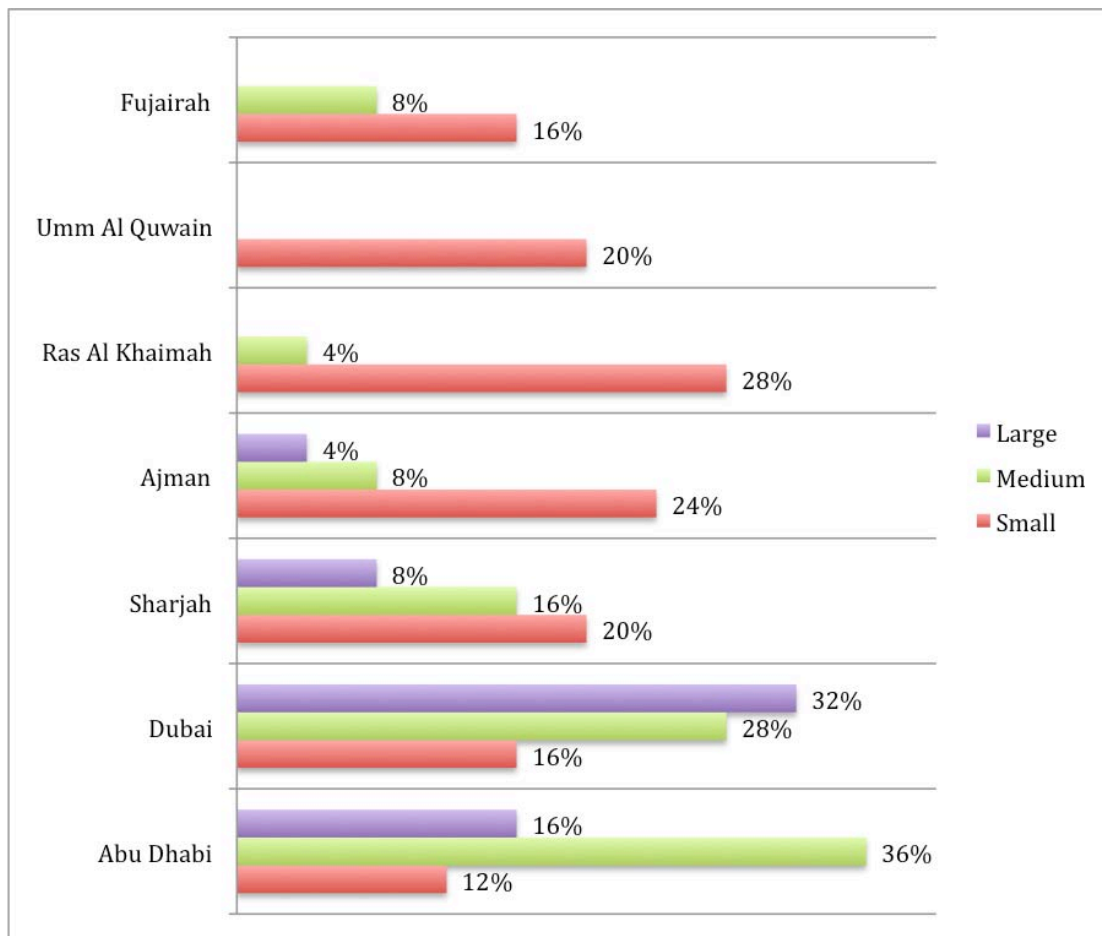


Figure 4.4. Sizes of Organisations’ That Have Responded From Each Emirate

Figure 4.5 is the summary of the total respondents from small, medium and large organisation in the United Arab Emirates. The reason for using the “size of the organisation” as one of the descriptions or categories is that this can help

identify the type of organisations that are using or looking into using environmental supply chain management, and therefore identify if “size of the organisations” is a criteria or a major factor in this research.

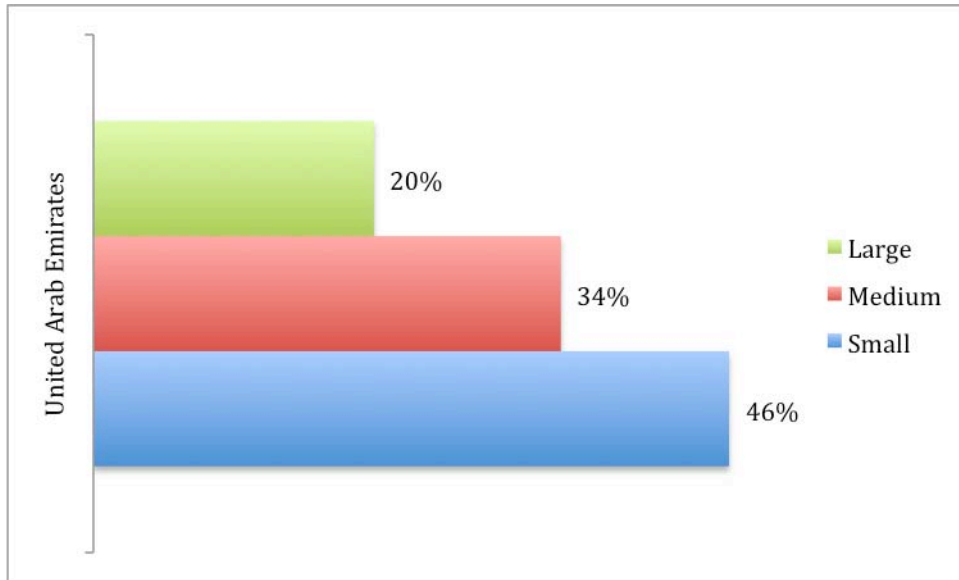


Figure 4.5. Summary of Sizes of Organisations that Have Responded In the UAE

Figure 4.6 shows the percentage of small, medium and large organisations that have responded to the online questionnaires from each Market. There were no responses from any Large Organisations in the Education, real Estate and Manufacturing Market.

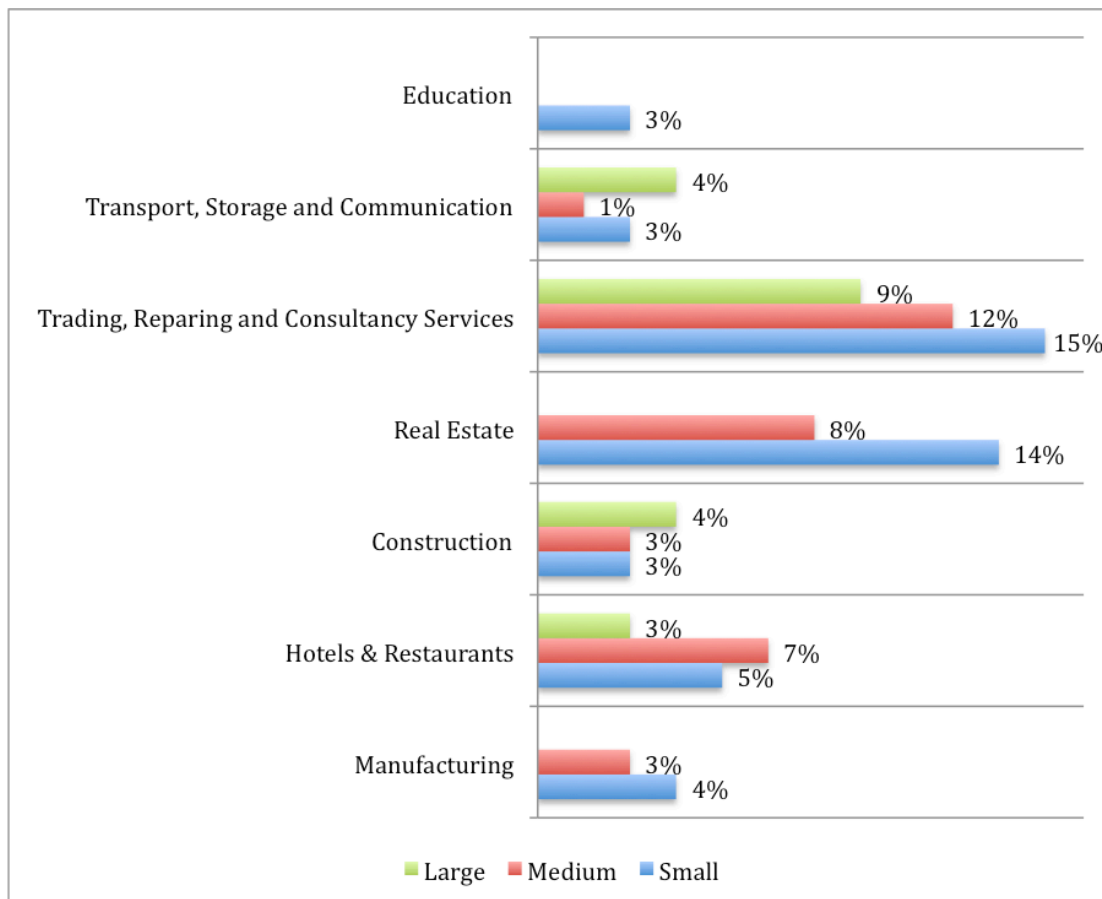


Figure 4.6. Sizes of Respondents’ Organisations in the Different Markets

4.3.6. Usage of Environmental Supply Chain Management

This section focuses on the usage of environmental supply chain management in the organisations, in terms of its adoption or lack of adoption, and reasons behind their adoption or lack of adoption of the environmental supply chain. The key drivers of environmental supply chain management are identified in this section. This information was collected from the “Usage of Environmental Supply Chain Management” section on the online questionnaire.

4.3.6.1. Adoption of Environmental Supply Chain Management

Some organisations have already adopted the environmental supply chain management system and are using it to its fullest. Of the organisations that have

responded to the questionnaire; 32% have adopted the environmental supply chain management, 27% and looking into adopting this method of supply chain management in the next year or two (2). **Figure 4.7** shows that 7% would take at least 3 years to adopt this method, and 3% would need more than 3 years. 31% of the respondents have either no idea when the organisation will adopt the environmental supply chain management.

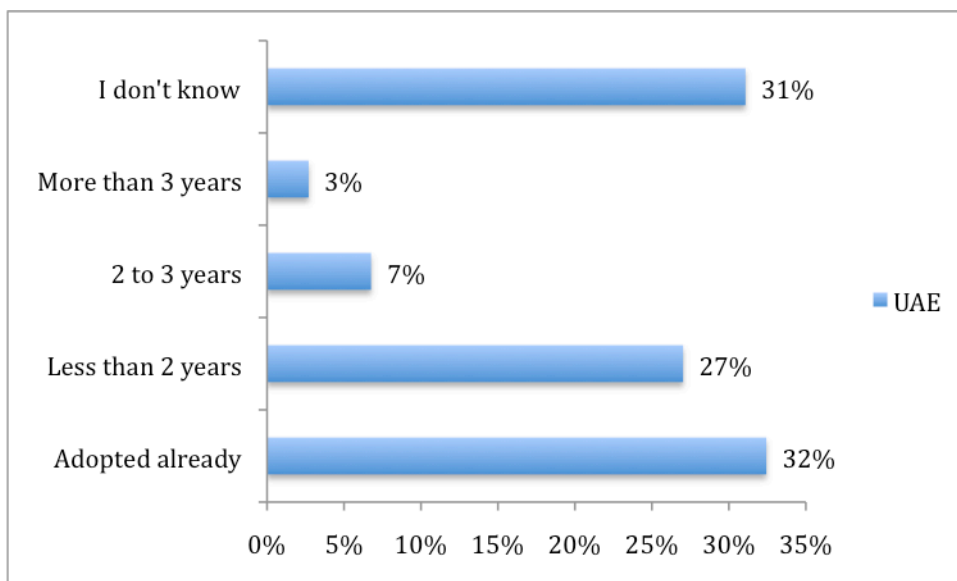


Figure 4.7. Percentage of Organisations that have responded, considering Environmental Supply Chain Management

Dubai has the largest number of respondents that have adopted the environmental supply chain management, with Abu Dhabi coming in next. Umm Al Quwain and Fujairah had no respondents that have adopted the environmental supply chain management and Umm Al Quwain has no respondents looking into adopting this method of supply chain management. **Figure 4.8** shows what part each Emirate is playing in adopting the environmental supply chain management.

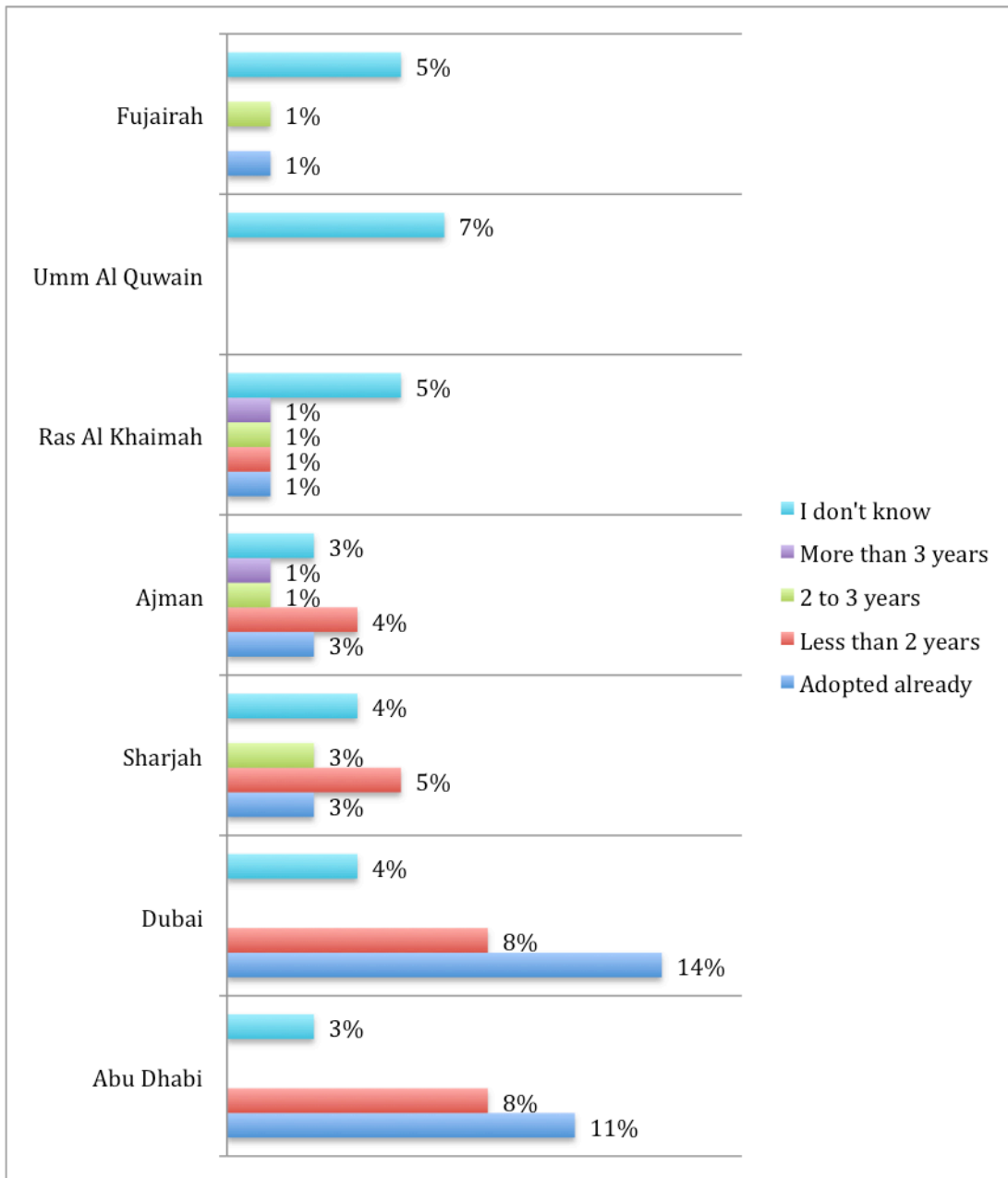


Figure 4.8. Organisations from Each Emirate considering adopting Environmental Supply Chain Management

Figure 4.9 shows that the “Trading, Repairing and Consultancy Services” market sector is leading the way to using the environmental supply chain management and the “Construction” market comes next. 3% of the “Education” market has already adopted the environmental supply chain management

meaning 100% of the “Education” markets are using this method of supply chain management; only 3% of the respondents were from the “Education” market in the first instance.

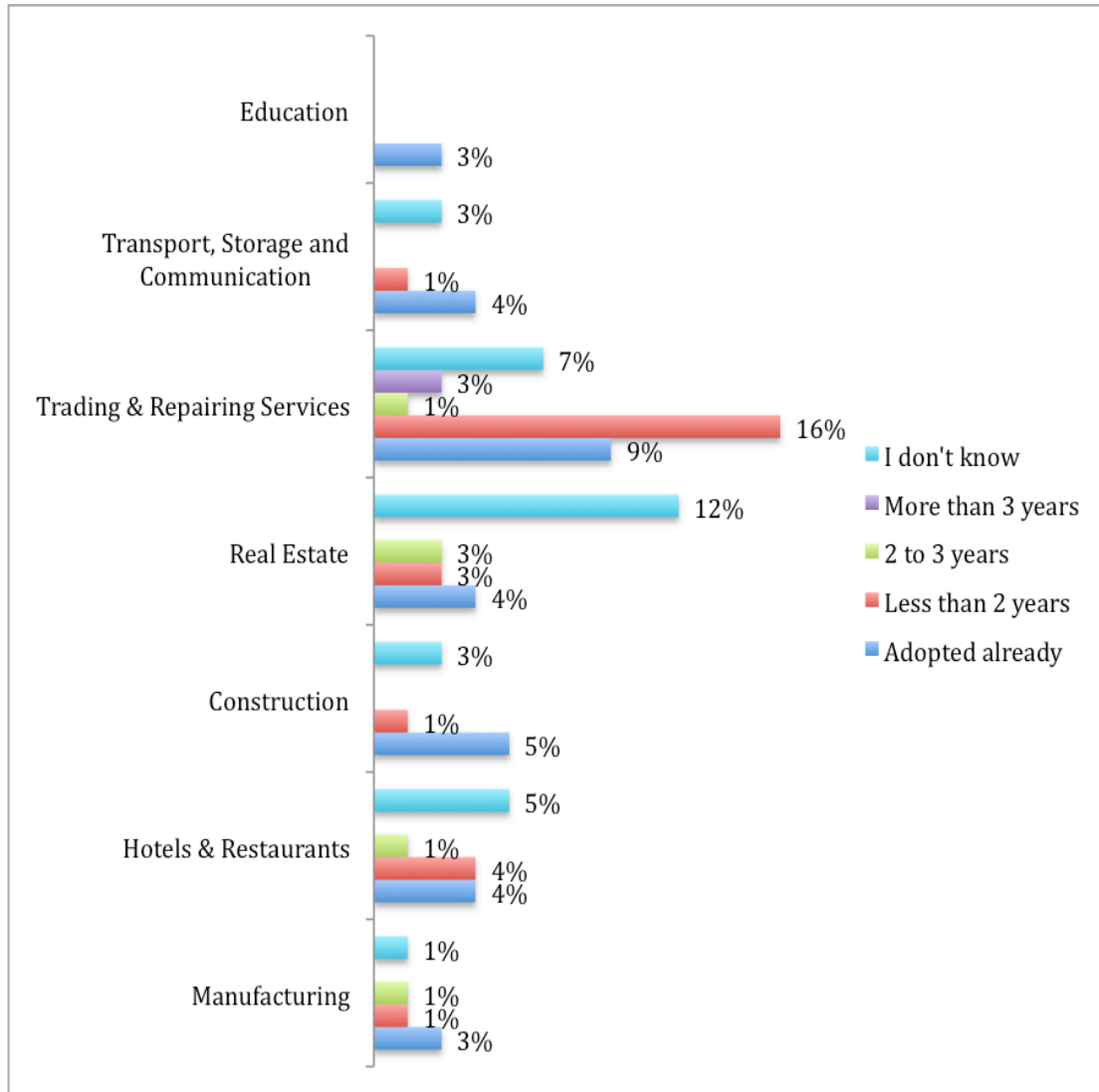


Figure 4.9. Respondents from the different markets who are considering Environmental Supply Chain Management

4.3.6.2. Reasons to Adopt Environmental Supply Chain Management

Organisations that have not adopted the environmental supply chain management have selected “Not Applicable” to this question, which is 31% of the respondents. The reasons mentioned in **Figure 4.10**, are main pressures and drivers for adopting environmental supply chain management. The primary drivers are consumer expectations cited to be 35% and compliance with local government regulations, cited to be 28% for organisations who have declared that they factor environmental supply chain management in their decision making. This just shows how important consumer awareness and government regulation is to the framework for environmental and other social issues in the environmental supply chain management in the United Arab Emirates. These two factors can be used to increase the number of organisations in the United Arab Emirates that factor environmental supply chain management in their decision making process.

Competitive behaviour in the local market comes next with 26% and the roles to sustainability both are the next important motive both with 16%. Other influences in decisions to adopt environmental supply chain management are cost reduction with 9%; export countries regulations with 4 %, and quality, health and safety policies with 14%.

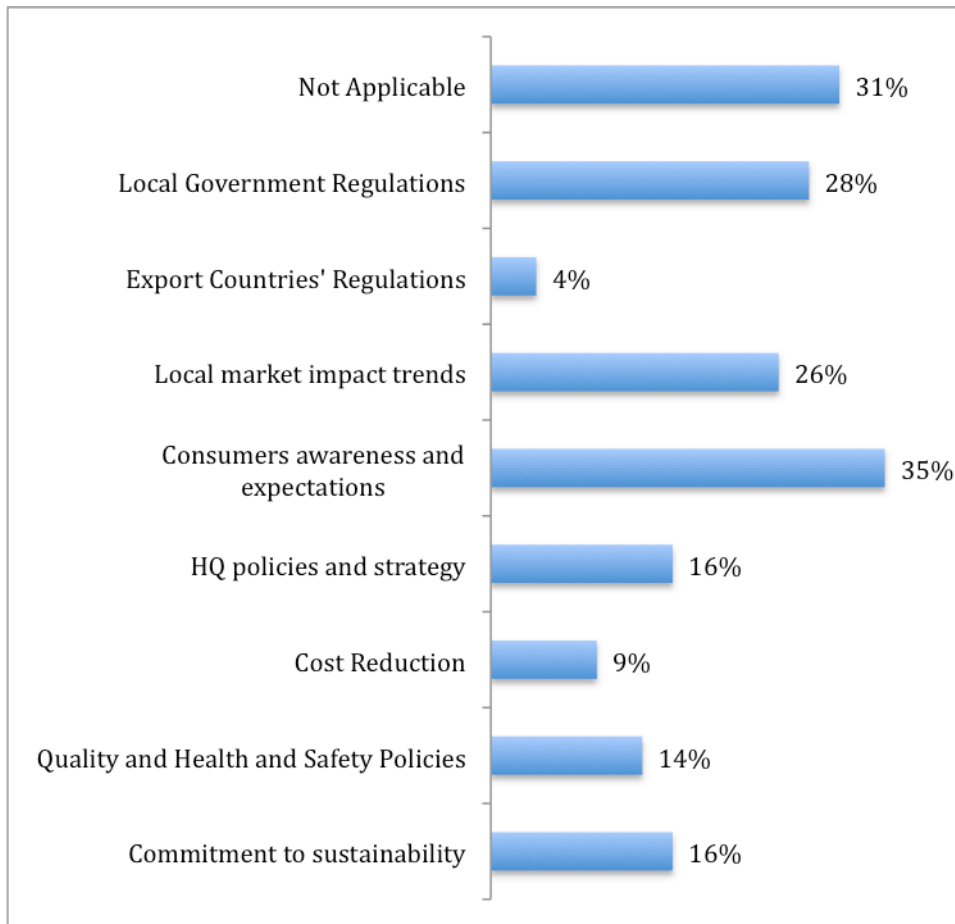


Figure 4.10. Reasons Respondents in the UAE have adopted the Environmental Supply Chain Management

The “Trading, Repairing and Consultancy Services”, the “Transport, Storage and Communication”, and the “Hotels and Restaurants” sector have cited “Consumer Awareness and Expectations” as the main reason for factoring environmental supply chain management in their decision making, unlike industrial sectors real estate, construction, education and manufacturing sectors (See **Figure 4.11**). In addition, the larger the company, the greater the pressure that consumers and the local market competition appear to exert, see **Figure 4.12**.

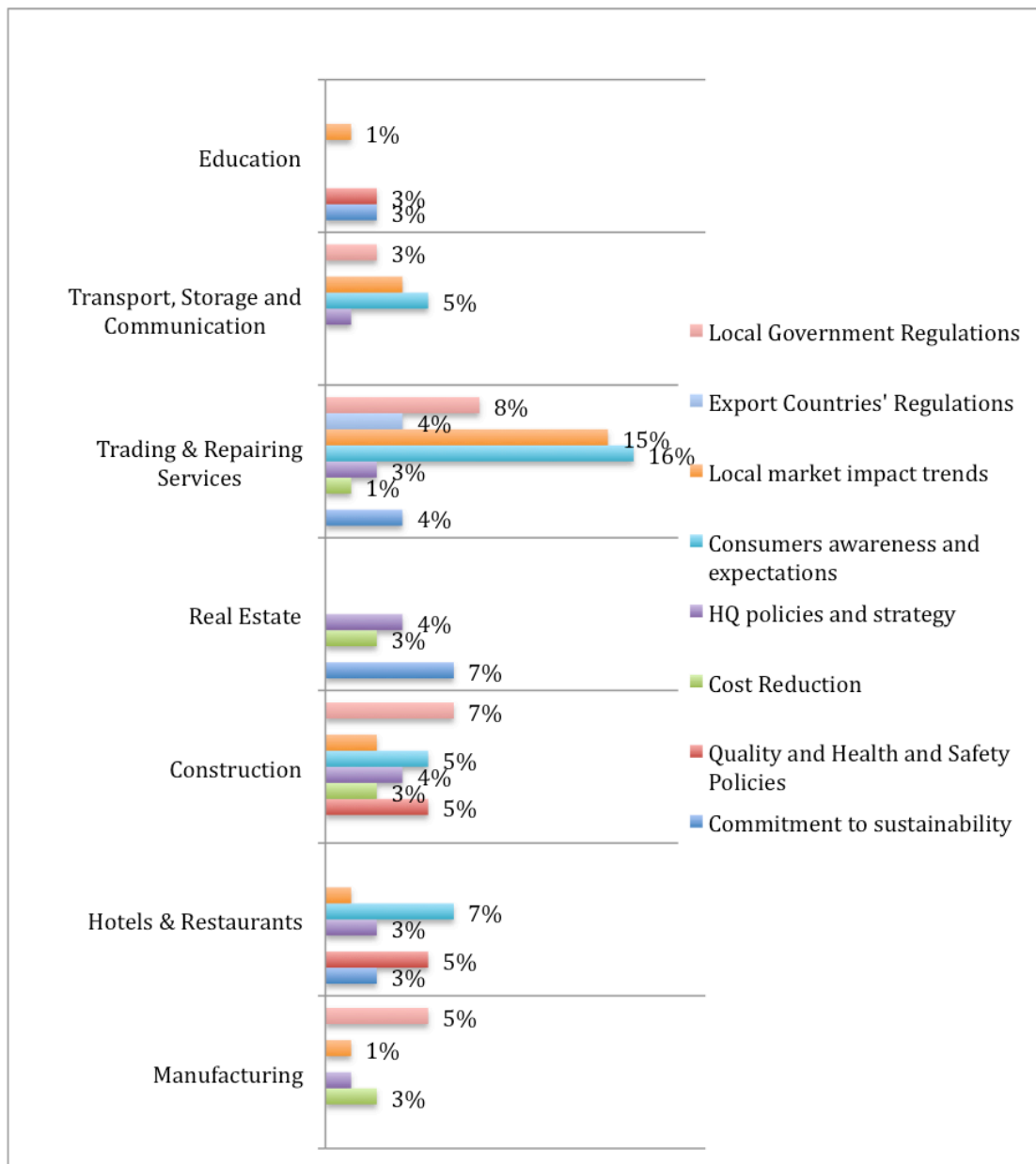


Figure 4.11. Reasons Each Emirate Has Adopted Environmental Supply Chain Management

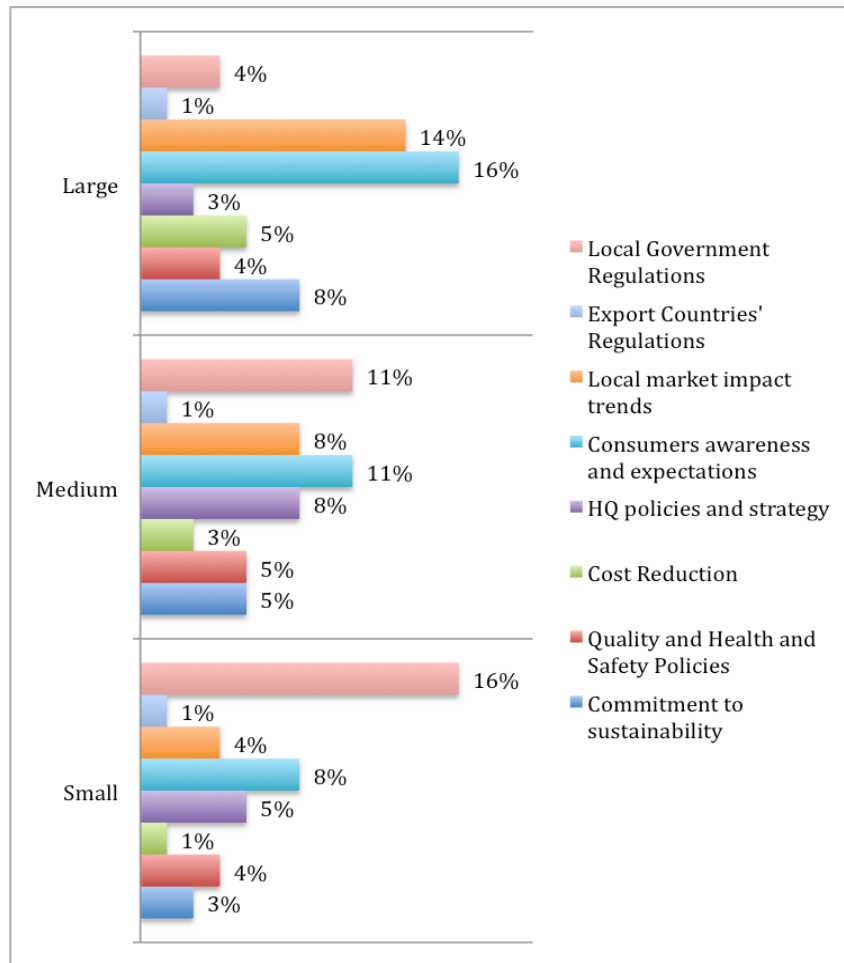


Figure 4.12. Reasons to adopt Environmental Supply Chain Management in Different Organisation Sizes.

4.3.6.3. Reasons Not to Adopt Environmental Supply Chain Management

Organisations that have already or are planning to factor / adopt environmental supply chain management into their decisions making process have selected “Not Applicable” for this question; these are 69% of the respondents. The rest have selected their reasons for not adopting the environmental supply chain management, these are certain obstacles or barriers that are preventing them from factoring environmental supply chain management. See **Figure 4.13**, to view the reasons as well as the percentage each one scored. “Lack of supplier awareness” with 26% response and “Insufficient environmental supply chain

knowledge” with 22% has been the most common, followed by lack of training and allocation of funds. One of the most revealing results of the survey is that there are no respondents cited for “No return on investment” and “Not our responsibility to deal with environmental Issues”. This suggests that reluctance is not based on financial or commitment to the environmental constraints.

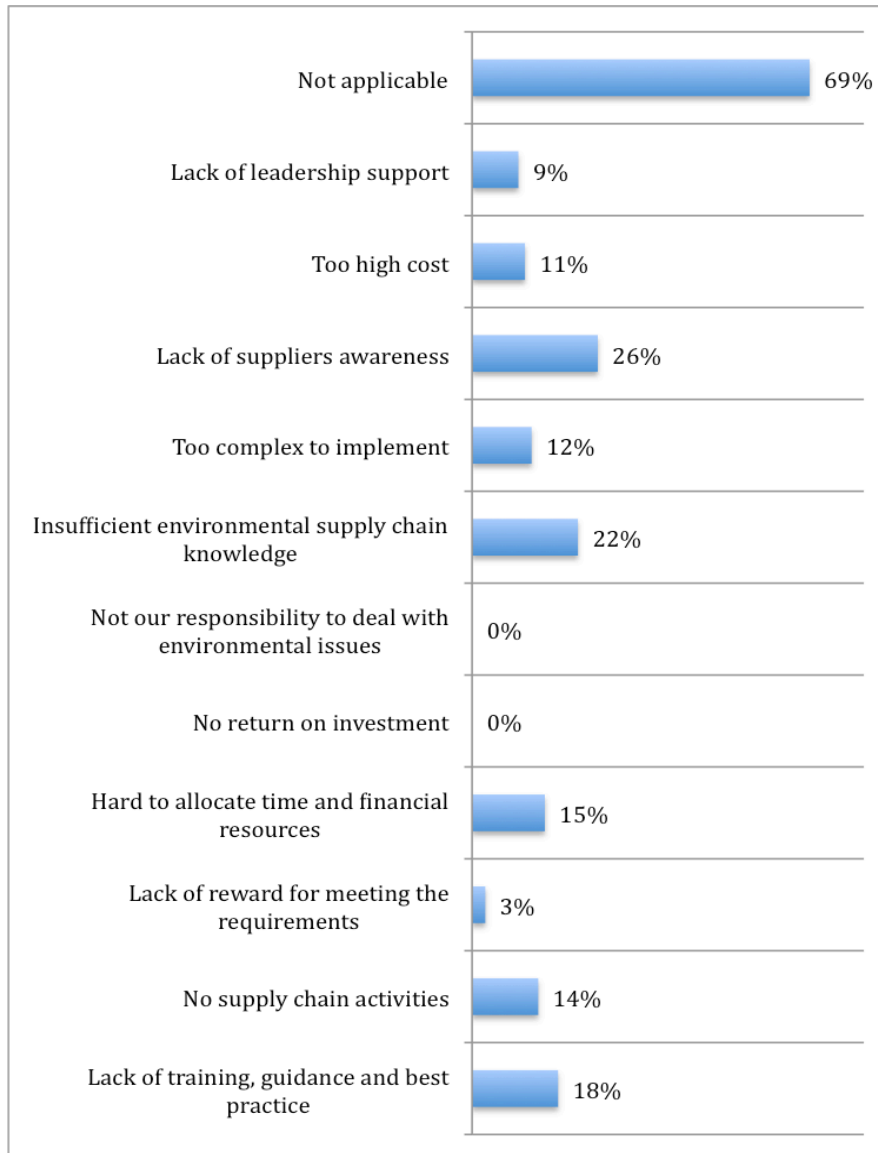


Figure 4.13. Reasons for Not Adopting Environmental Supply Chain Management in the United Arab Emirates

Here again, obstacles to adopting green supply chain vary depending on the market sectors. “Trading and Repairing Services” with 7%, “Real Estate” with

9%, cite lack of suppliers more frequent than in other industrial sectors. In the Construction industry, 4 % cite “hard to allocate time and financial resources” as their main barrier, see **Figure 4.14**.

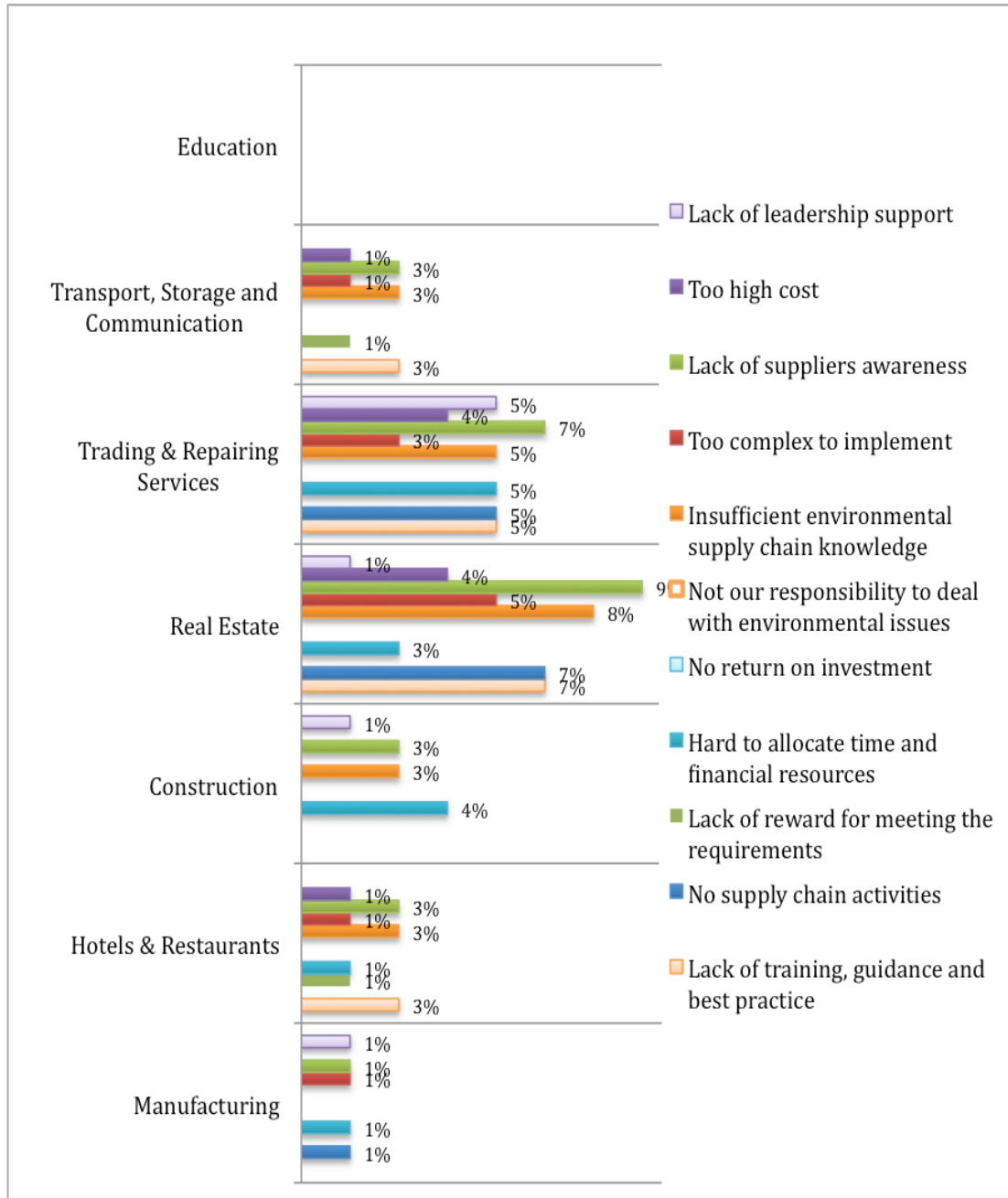


Figure 4.14. Reasons for Not Adopting Environmental Supply Chain Management in the United Arab Emirates Market Sectors

4.3.7. Life Cycle Assessment

This question was introduced in the questionnaire to better analyse the extent and commitment of using environmental supply chain management in organisations, as you can see that 71% (See **Figure 4.15**) of the organisations that have already adopted environmental supply chain management use life cycle analysis to investigate and evaluate the environmental impacts of a given product or service caused or necessitated by its existence. Mostly Large organisations were the ones who use life cycle assessment; while no small organisations are using it, see **Figure 4.16**.

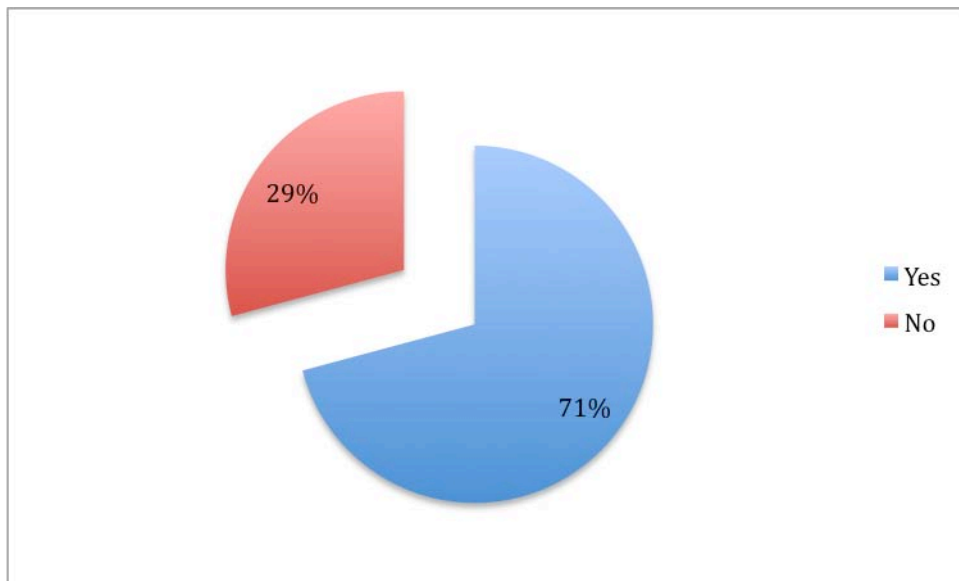


Figure 4.15. The use Of Life Cycle Assessment Among Organisations that have already adopted ESCM.

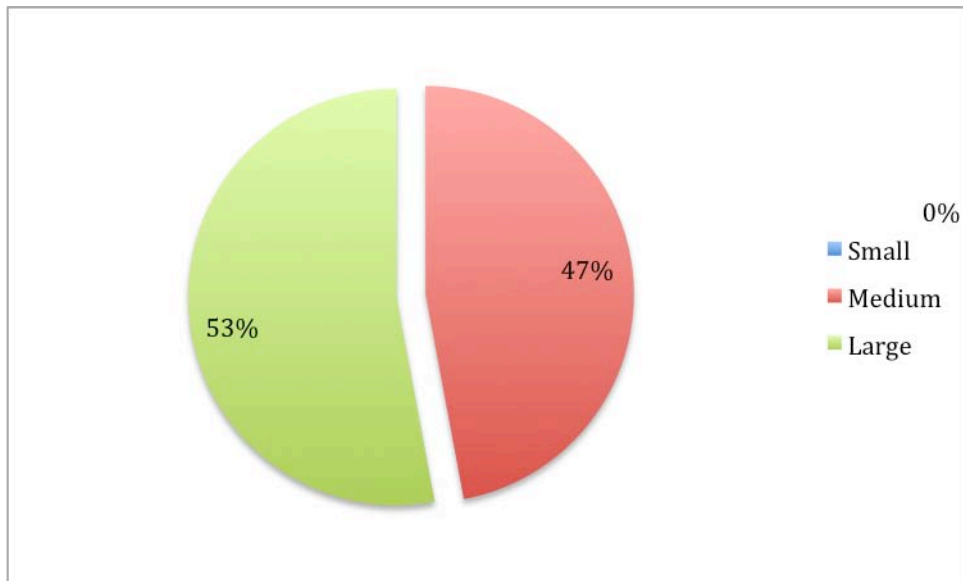


Figure 4.16. The Use Of Life Cycle Assessment Among the Different Organisation Sizes.

4.4. Estimation

4.4.1. Comparing This Research and “The Green Supply Chain In Dubai”

In Dr. Rettab and Dr Bin Brik’s research of 2008, only 38% of companies factored environmental supply chain concerns into strategic decisions in Dubai, demonstrating that only a few companies recognized the importance of environmental and social issues, as they have applied this specifically to their supply chain operations, see **Figure 4.17**.

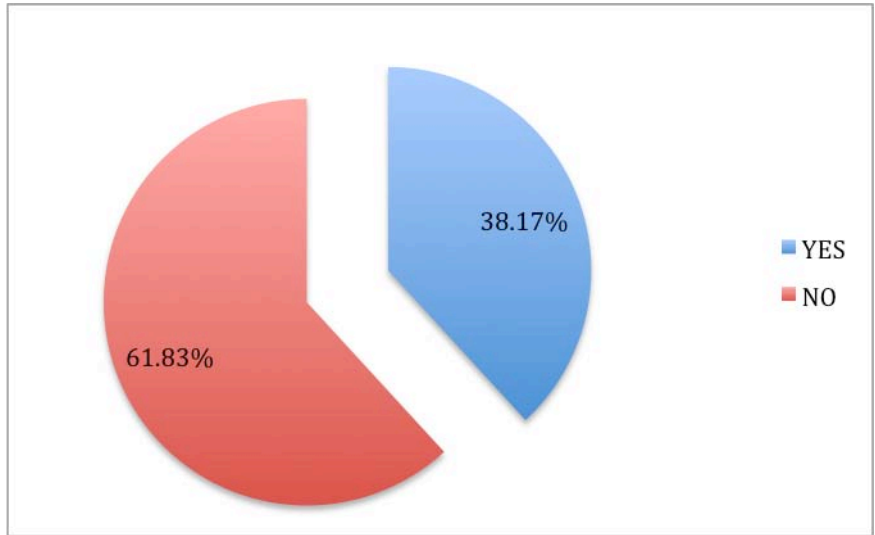


Figure 4.17. (a) Maturity of Green Supply Chain (Rettab and Ben Brik, 2008)

Organizations Using ESCM in 2008

There is already an increase of organisations that have factored environmental supply chain concerns into their strategic decisions in Dubai, from 38% to 53%, see **Figure 4.18**.

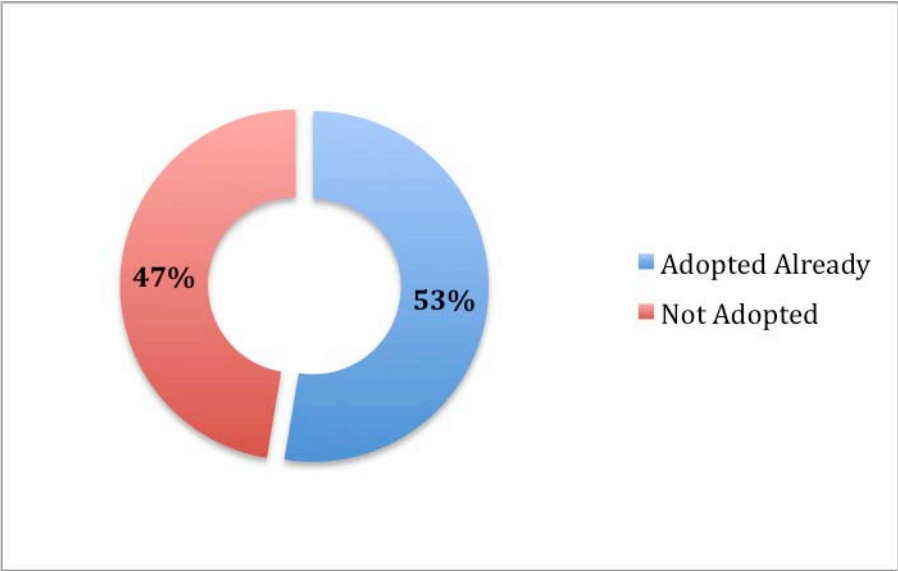


Figure 4.18. Increase in Organisation using ESCM in Dubai since 2008

In Dr. Rettab and Dr Bin Brik's research of 2008, 27% were planning to include environmental supply chain into their decision making in the next year or two, 11 % in the next three years, and 17% of the respondents would require more than 3 years, see **Figure 4.19**. As you can see in **Figure 4.20**, this is completely different, 67% are planning to consider environmental supply chain in their decision making in the next two years, and no organisations taking longer. This means that those planning to adopt since 2008 have already adopted the environmental supply chain management, which would explain the increase of organisations that have already adopted the environmental supply chain management. And those who have not adopted the environmental supply chain management are either not planning to adopt it due certain barriers and obstacles discussed in **Figure 4.13** and **Figure 4.14**, or are not quite sure of the situation their organisations have with the concerns of environmental issues (33%, which is 12% less than in 2008).

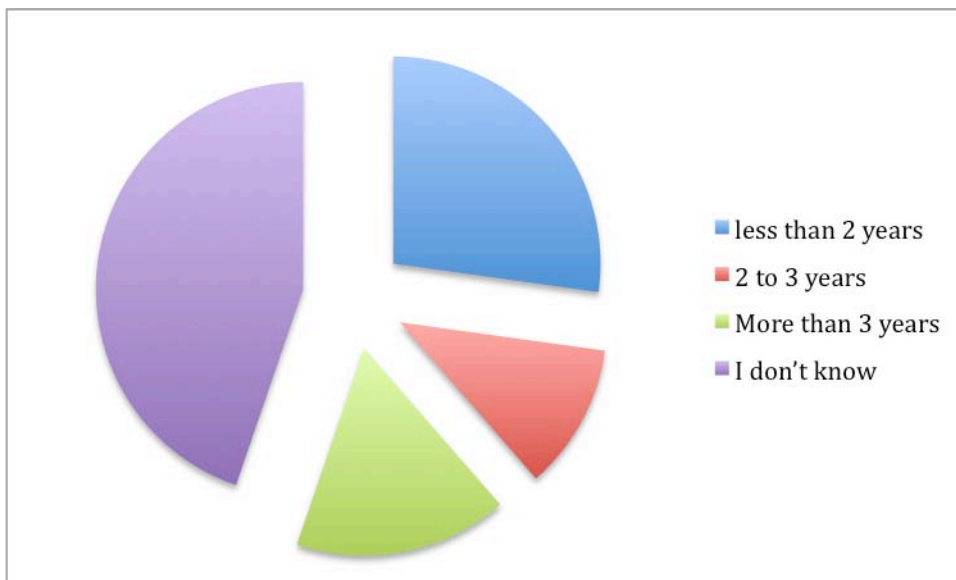


Figure 4.19. (b) Maturity of Green Supply Chain (Rettab and Bin Brik, 2008)

Organisations Considering adopting the Environmental Supply Chain

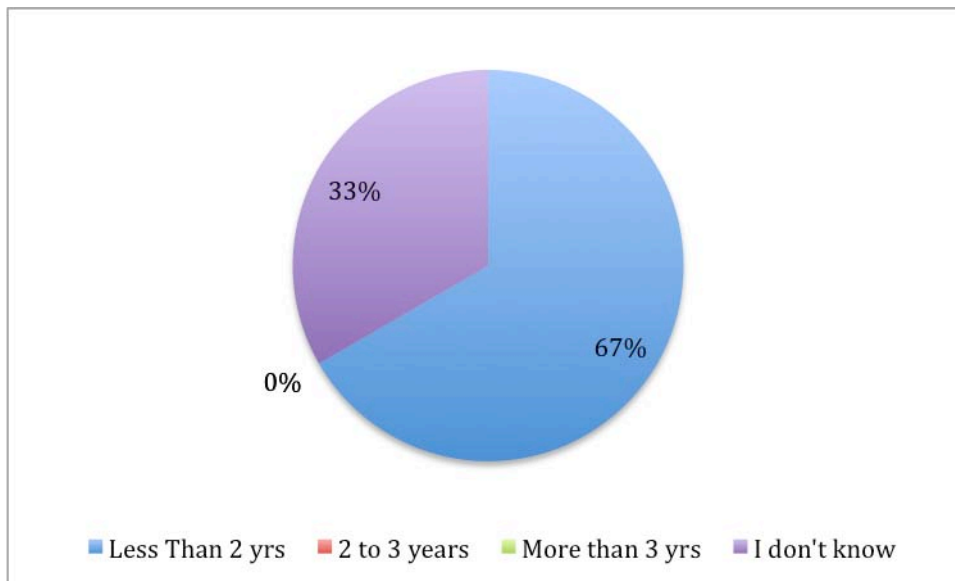


Figure 4.20. Organisations Considering adopting the Environmental Supply Chain management in Dubai

4.5. Correlation Analysis

Correlation analysis is a family of statistical tests to determine mathematically whether there are trends or relationships between two or more sets of data from the same list of items or individuals. The tests provide a statistical yes or no as to whether a significant relationship or correlation exists between the variables. A correlation test consists of calculating a correlation coefficient from the two data sets and then comparing this coefficient to an appropriate entry in a table of correlation coefficient criterion numbers (Childress, 1985).

In order to examine the study variables, SPSS software was used in analyzing the collected data. Then a reliability test and a correlation/bi-variate test are done

on four data sets. Bi-variate means we are examining the simple association between 2 variables.

- a. Organisations who have senior managers whose primary responsibility is including green supply chain issues
- b. Organisation who have been using life cycle assessment to measure their environmental supply chain
- c. Organisations ability to expand to new markets
- d. Organisations ability to reduce logistics costs
- e. Organisations ability to establish a competitive advantage.

Item 1 is collected from the online questionnaire; see **Figure 4.21**, where it shows that only a few organisations that use environmental supply chain management have senior managers, around 15%. Item 2 is collected from the online questionnaire; see **Figure 4.15**, where is shows that 71% of organisations that use environmental supply chain management use life cycle assessment.

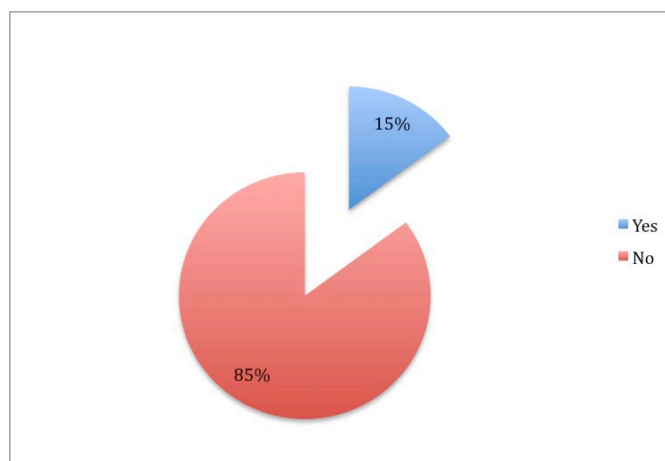


Figure 4.21. Organisations that have Senior Managers Responsible for Environmental Supply Chain management

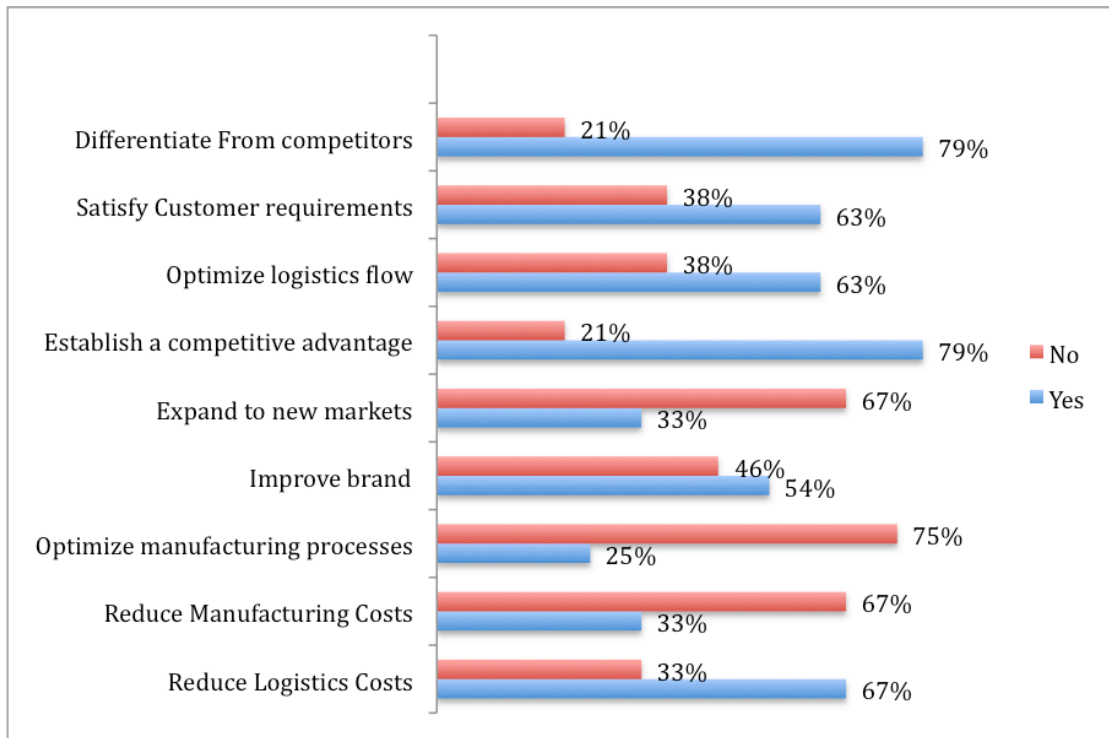


Figure 4.22. How ESCM has helped Organisations?

4.5.1. Hypotheses

Having considered the findings from the online questionnaire, this study will attempt to explore to explore the hypotheses discussed in **Section 3.2.2 and Section 3.2.3**. Six general hypotheses were developed from these hypotheses for this purpose, namely:

H1. ESCM Senior Managers influence organisations to expand to new markets

H2. ESCM Senior Managers influence organisations to reduce logistic costs

H3. ESCM Senior Managers influence organisations to establish a competitive advantage.

H4. Life Cycle Assessment in organisations influence organisations to expand to new markets

H5. Life Cycle Assessment in organisations influence organisations to reduce logistic costs

H6. Life Cycle Assessment in organisations influences organisations to establish a competitive advantage.

4.5.2. Results

Table 4.1 shows the correlation between each variable. From the results we can come to a conclusion regarding the status of **H1, H2, H3, H4, H5, and H6**, shown in **Table 4.2**.

		ExpandToNew Markets	ReduceLogistic Costs	EstablishCom petitiveEdge
ESCMSeniorManagers	Pearson Correlation	.669**	.056**	.650**
	Sig. (2- tailed)	.000	.000	.000
	N	38	38	38
LCA	Pearson Correlation	.030**	.611**	.656**
	Sig. (2- tailed)	.830	.000	.000
	N	38	38	38

Table 4.1. Correlation is significant at the 0.01 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

Hypothesis	Status
H1	Ha*
H2	Ha*
H3	Ha*
H4	Ho**
H5	Ha*
H6	Ha*

Table 4.2. Status of Hypotheses

*. Ha means that Ho is rejected, or the hypothesis is supported.

** . Ho means that the hypothesis does not exist.

4.6. Summary of Findings

The purpose of the study is to use the findings to derive a solution that will help increase the use of environmental supply chain management efficiently hence encourage standards of good practice in organisations ethics, corporate responsibility, and environmental responsibility. In order to do this, all objectives will need to be achieved. Separating the objectives into three data analyses method, descriptive, estimate and hypothesis helped achieve these objectives.

We were able to estimate that Dubai and Abu Dhabi being the two emirates that are leading the way with environmental supply chain management, taking into consideration the high response rate from these two Emirates. The key drivers and barriers of environmental supply chain were identified and it was concluded

that mostly organisations adopt environmental supply chain because of consumer requirements and most organisations would not adopt environmental supply chain because of lack of suppliers.

Data collected from Dubai respondents were compared with the 2008 research by Dr. Anis Ben Brik and Dr. Beliad Rettab, only to conclude that not much has changed since 2008, although few organisations are looking into adopting environmental supply chain management, a lot more have already adopted it.

Data that collected and entered into SPSS was used to derive the status of six (6) hypotheses. It was derived that hiring a senior manager or even having a separate department would influence the success of the organisation in a positive way.

4.7. Results Discussion

The results of the study were summarized in the previous section, **Section 4.6**. The sections that follow mainly analyse and discuss these findings or results in reference to the findings in the literature review. Each section discusses an objective of this research.

4.7.1. Emirates Leading the Way

By identifying the leading emirate in the successful application of environmental supply chain management, it would allow the other Emirates, to have a goal and role model, in order for them to climb up to the same level of sustainability. This might in turn increase the percentage of organisations using the environmental

supply chain management and enhance the use of the environmental supply chain, which will in turn promote the United Arab Emirates as a Sustainable country.

Dubai and Abu Dhabi are the emirates taking the lead when it comes to sustainable development. Abu Dhabi is the home of the world's first carbon-neutral, zero-waste city, Masdar City. Their main aim is to become the Silicon Valley for clean, green and alternative energy. Dubai has launched ENPARK, the Energy and Environmental Park, a sustainable community and a Free Zone that will look into energy conservation and solar and wind schemes to help meet electricity needs, their ambition is to build a sustainable culture.

Abu Dhabi and Dubai have the highest number of responses to the online questionnaire, and also have a higher percentage of organisations that have adopted environmental supply chain management. Dubai has a higher percentage of large organisations that are also practicing life cycle assessment with a separate department handling environmental supply chain management than Abu Dhabi.

4.7.2. Key Drivers of Environmental Supply Chain Management

By identifying the key drivers that would help in increasing the use of environmental supply chain management in organisations in the United Arab Emirates, it would make it easier to convince organisations to use the environmental supply chain management effectively and lead them to a sustainable future.

The literature review revealed that the key drivers to establish environmental supply chain management practices have internal and external sources.

The main external sources are

a. Regulations, Government Compliances

A good percentage of respondents have chosen “local government regulations” being one of the reasons they have adopted environmental supply chain management, see **Figure 4.10**. “HQ policies and strategy” would also come under this category, making it a total of 44% of the respondents. This is considered as the most important aspect when creating an effective environmental supply chain management, as organisations are required to comply with these regulations and legislations. The United Arab Emirates has several environmental laws that deal with the environmental impact assessments and the procedures involved and responsibilities implementing the laws.

b. Consumer Requirements

Figure 4.10 shows that a major percentage of the respondents have implemented environmental supply chain because of consumer awareness and expectations. Consumers are increasingly becoming concerned about the safety and environmental impacts as well as the origins of the product. This would result in suppliers doing everything they can to avoid losing these customers hence adopting the environmental supply chain management.

c. Competitive Advantage

The literature review discusses that organisations used to compete over prices and quality, but now a major percentage compete more on environmental issues as well, this has also been identified in this research, see **Figure 4.10** showing the percentage of respondents who have adopted environmental supply chain management because of “Local market impact and trends”. Practicing environmental supply chain management can help the organisations in entering into regions those might not have been previously supportive.

d. Supplier commitment

In some organisations a set of criteria as established and used in selecting key suppliers. Proactive management of supplier environmental performance can lead to product and process simplification, more efficient resource utilization and product quality improvement. Hence is important to have suppliers who are also practicing environmental supply chain management. When selecting a supplier to deliver a product, you are basically selecting the product and including with it all the wastes and emissions that were created during the production of the product, during the use of the product until the end-of-life of the product. Some organisations are reluctant to move into using environmental supply chain management because they feel that there is a lack of suppliers with awareness and knowledge of environmental supply chain management, this is expressed in **Figure 4.13**.

The main internal sources include

a. Costs

All kinds of wastes are potentially raw materials, and a decrease in waste generation or energy consumptions will mean there is a decrease in raw materials and will result in decrease in costs and environmental impact. In **Figure 4.10**, organisations selected “Cost Reduction’ as one of the reasons to adopt environmental supply chain management. Although in **Figure 4.13**, “High cost” is one of the factors that prevent organisations to adopt environmental supply chain management. This factor can be major factor for some organisations as the initial cost to improving the organisation in environmental terms would only be possible if there was a substantial investment made. Sustainability is actually an investment; the return on investment can be of a great benefit to the organisations

b. Commitment to Sustainability.

Commitment to sustainability would be a major reason for adopting environmental supply chain management; this would mean organisations have committed to set aside a budget and policies, see **Figure 4.10**. Organisations are adopting corporate social responsibilities mostly because it is the right thing to do, these organisations are also evaluated by these values as they take into consideration how they impact and affect the lives of the people.

4.7.2. Comparing This Research and “The Green Supply Chain in Dubai”

By comparing the results obtained in this research and the results obtained by Dr. Anis Ben Brik and Dr. Beliad Rettab in 2008, it will allow identifying major changes since 2008, and also help analyse the key determinants that have helped organisations in 2008 in Dubai move towards sustainability. These determinants can therefore be used to help the other Emirates move towards sustainability.

There is already an increase of organisations in that have factored environmental supply chain concerns into their strategic decisions in Dubai, from 38% to 53%. This could be because of the increase of awareness of environmental supply chain management among industries and consumers see **Figure 4.17** and **Figure 4.18**. But this is also evidence that there is still a need to spread the awareness regarding environmental concerns in the supply chain to companies in Dubai, and from **Figure 4.7**, shows that awareness needs to be spread to all the other Emirates as well. There is also an increase in organisations that are looking into adopting environmental supply chain since 2008, from 27% to 67%, see **Figure 4.20**. You can also tell from this figure that there are more organisations moving into environmental supply chain management. Organisations are now more aware of the system and its benefits.

4.7.3. Life Cycle Assessment

By identifying if using Life Cycle Assessment is actually an advantage to an organisation and in what way, this can help increase project success rate in organisations that have already adopted environmental supply chain

management, and as well as sell the environmental supply chain system to organisation that have not yet adopted it.

This new variable is added to the questionnaire to investigate the extent to which organisations are using environmental supply chain, and this can be derived to how well they are using life cycle assessment. Only 71% which were mostly large organisations, see **Figure 4.15** and **Figure 4.16**, who have introduced life cycle assessment into their organisations, these organisations have successfully established competitive advantage and reduce logistics costs see **Figure 4.22**. This would mean that these organisations have integrated the life cycle assessment in overall management of their supply chain towards a sustainable direction. Combining life cycle and sustainability management will improve image and brand value. 29% of the organisations that have not applied life cycle assessment are lagging behind in terms of competition and reducing costs. This was further investigated using SPSS to test data collected to confirm this theory. Below are the results from this test that relates to the literature discussed.

H4. Life Cycle Assessment in organisations influences organisations to expand to new markets.

From the **Table 4.1**, you can see that Life Cycle Assessment in organisations correlates positively with “Expand to New Markets”, but with a significance level (p-value) higher than 0.05, H_0 is retained, concluding there is no relation between the two variables, and thus H_1 is not supported.

H5. Life Cycle Assessment in organisations influences organisations to reduce logistic costs.

From the **Table 4.1**, you can see that Life Cycle Assessment in organisations correlates positively with “Reduce Logistic Costs”, with a significance level (p-value) lower than 0.05, which would mean that the two variables are linearly related, thus H1 is supported and Ho is rejected

H6. Life Cycle Assessment in organisations influences to establish competitive edge.

From the **Table 4.1**, you can see that Life Cycle Assessment in organisations correlates positively with “Establish Competitive Edge”, with a significance level (p-value) lower than 0.05, which would mean that the two variables are linearly related, thus H1 is supported and Ho is rejected

4.7.4. Separate Department for Managing Environmental Supply Chain

By identifying is having a separate department responsible for the environmental supply chain management will allow the organisations who have committed to sustainability to better analyse their supply chain, and reduce all negative impacts to the environment at the highest level.

In the literature review it was discussed that when implementing environmental supply chain management it is quite crucial to have a separate department or individual that will be responsible for environmental supply chain. This was

further investigates using SPSS to test data collected to confirm this theory.

Below are the results from this test.

H1. ESCM Senior Managers influence organisations to expand to new markets.

From the **Table 4.1** you can see that ESCM Senior Managers correlates positively with “Expand to New Markets”, with a significance level (p-value) lower than 0.05, which would mean that the two variables are linearly related, thus H1 is supported and Ho is rejected

H2. ESCM Senior Managers influence organisations to reduce logistic costs.

From the **Table 4.1** you can see that ESCM Senior Managers correlates positively with “Reduce Logistic Costs”, with a significance level (p-value) lower than 0.05, which would mean that the two variables are linearly related, thus H1 is supported and Ho is rejected

H3. ESCM Senior Managers influence organisations to establish competitive edge.

From the **Table 4.1**, you can see that ESCM Senior Managers correlates positively with “Establish Competitive Edge”, with a significance level (p-value) lower than 0.05, which would mean that the two variables are linearly related, thus H1 is supported and Ho is rejected

4.8. Summary

The aim of this research was to increase and enhance the use of environmental supply chain management in organisations throughout the United Arab Emirates, making this study different from past works of research in this area and region.

The research identifies Abu Dhabi and Dubai as the Emirates are leading the way towards accomplishing an environmental friendly country, and the other emirates should follow.

The research identifies the key drivers of environmental supply chain management that would drive organisations to adopt this method of supply chain. These drivers are consumer pressure, competitive advantage, cost savings, legislation, and corporate social responsibility and supplier relations.

This research identifies that organisations that use life cycle assessment to measure the environmental supply chain are more likely to have successful project with very little impact on the environment, as it will involve analysis of the projects environmental impacts from cradle to grave.

The research also identifies the advantage of having a separate department or an appointed individual to keep track of the supply chain and find other ways of improving the environmental supply chain.

CHAPTER V

Conclusion and Future Recommendations

5.1. Limitations

- Data was collected in a specific time of the year. These findings do not support a conclusion that the responses received in this study would be similar to responses at any other given time.
- The time was limited, and there was not enough time for the researcher to contact organisations directly, or to review their environmental supply chain management systems and conduct interviews for a better understanding of how organisations are utilizing this system. There was also no opportunity for the researcher to follow up with the online questionnaire and encourage them to participate in the study.
- The population of organisations that have responded was uneven throughout the Emirates and uneven throughout the Industries, which would mean that the findings in this study would be an approximation, rather than a final result.

5.2. Conclusion

United Arab Emirates is experiencing a major shift from the stand-alone unit business to the supply chain management system. At the same time, there is also a noticeable progress in the recent years towards consciousness about the environment. The customers are more inclined towards the eco-friendly aspects of the products and services offered to them by the providers.

The purpose of this research was to identify how to increase the number of organisations that factor employ and also enhance the use of environmental supply chain management. The past works of Dr. Beliad Rettab and Dr. Anis Ben Brik (2008) allowed certain variables to be identified and used in this research. The difference between their research and this research is that their research was only of Dubai as an emirate, whilst this research investigates the whole of the United Arab Emirates as well as adding a new variable “Life Cycle Assessment”, which could be used to enhance the use of environmental supply chain.

The findings of primary data and secondary data showed that:

- Abu Dhabi and Dubai as the Emirates that are leading the way with environmental concerns. These two Emirates have the highest response rate when it comes to organisations that have implemented environmental supply chain management. They also have the highest response rate for organisations that have implemented life cycle analysis. But because the response population was uneven between the Emirates, the final result is only an approximation.

- In order to increase the use of ESCM, there needs to be an increase in consumer pressure, government and organisation regulations against negative impact on the environment. Currently 44% of the respondent adopted environmental supply chain because of government and organisation regulations and 35% because of consumer pressure.
- Organisations are now more aware of environmental supply chain management systems than in 2008. There is already an increase of organisations in that have factored environmental supply chain concerns into their strategic decisions in Dubai, from 38% to 53%. This could be because of the increase of awareness of environmental supply chain management among industries and consumers

With the help of a statistical application (SPSS), it has been concluded that:

- Using a variable called the Life Cycle Assessment could further increase the success rate of an organisation projects and reduce environmental impact. Life Cycle Assessment is proven to help organisations to reduce logistic costs and increase competitive advantage, in both cases there is a very high correlation level.
- Appointing a separate department in organisations to manage environmental supply chain could further increase the success rate of an organisation projects and reduce environmental impact. This variable has proven to help organisation expand to new markets, reduce logistic costs and increase competitive advantage. The variables “expand to new

markets” and “competitive advantage” has high correlation, making an even stronger relationship than “reduce logistic costs”.

The results of this study could be improved by future studies taking an even larger sample and also by comparing with other regions. Environmental supply chain management has proven to be a determinant for a successful organisation supply chain management, if applied correctly, and can ensure the organisations success to meet requirements of the project.

5.3. Recommendations

There are a number of issues that need further investigation within the context of environmental supply chain management; the following recommendations are the most relevant to current research, and the most practical.

1. Future research needs to establish a stronger link between environmental supply chain management initiatives, competitiveness and economic performance. This could provide a stimulus for companies to move towards a sustainable supply chain. Conducting an in-depth investigation of Environmental Supply Chain Management processes in organisations that are currently using it and identify long-term patterns in the fast growing economy of the United Arab Emirates.
2. Generating an environmental supply chain “Best Practice” management model, this can be implemented in other organisations. This practice will

investigate the operations of organisations that have implemented the environmental supply chain management system successfully.

3. A comparative study also needs to be done which contrast Leading Environmental Countries and the United Arab Emirates. The study could provide information on successful projects and an understanding of what else could be done to improve the environmental supply chain in organisations in the United Arab Emirates

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Appendix:

Questionnaire

Q.1. Which emirate is your office based in?

- a. Abu Dhabi
- b. Dubai
- c. Sharjah
- d. Ajman
- e. Ras Al Khaimah
- f. Umm Al Quwain
- g. Fujairah

Q.2. What market sector does your organization belong to?

- a. Manufacturing
- b. Hotels And Restaurants
- c. Construction
- d. Real Estate
- e. Trading & Repairing
- f. Transport, storage and Communication
- g. Education

Q.3. What is the size of your organization? (No. Of Employees)

- a. Small – 50 to 100 employees
- b. Medium – 101 to 500 employees
- c. Large – 500 and more

Q.4. How long until your organizations considers the adoption of environmental supply chain management?

- a. Already Adopted
- b. Less than 2 years

- c. More than 3 years
- d. I don't know

Q.5. What are the main reasons which have incited your company to take environmental supply chain management into consideration in your strategic decision making?

- a. Commitment to sustainability
- b. Quality and Health and Safety Policies
- c. Cost Reduction
- d. HQ policies and strategy
- e. Consumers' awareness and expectations
- f. Local market impact trends
- g. Export countries regulations
- f. Local Government regulations
- h. Not Applicable.

Q.6. What is the main reason for not adopting environmental supply chain?

- a. Lack of training, guidance and best practices
- b. No Supply Chain Activities
- c. Lack of reward for meeting the requirements
- d. Hard to allocate time and financial resources
- e. No return on investment
- f. Hard to allocate time and financial resources
- g. No return on investment
- h. Not our responsibility to deal with environmental issues
- i. Insufficient environmental supply chain knowledge
- j. Too complex to implement
- k. Lack of suppliers awareness
- l. Too high cost
- m. Lack of leadership support
- n. Not applicable.

Q.7. Does your company have a senior manager whose primary responsibility includes environmental supply chain management?

a. Yes

b. No

Q.8. Has Environmental Supply Chain Management helped your organization with the below?

	Yes	No
Reduce manufacturing costs		
Reduce logistics costs		
Optimize manufacturing processes		
Improve Brand		
Expand to new markets		
Establish a competitive advantage		
Optimize logistics flow		
Satisfy customer requirements		
Differentiate from competitors		
Not applicable		

Q.9. Does your company use Life Cycle Assessment to measure your environmental supply chain?

a. Yes

b. No