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Implementation of Innovative Green Management Methods in the Supply Chain: The Case of the Greek Manufacturing Sector

By:

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To my mother and father

"The universe doesn't allow perfection."

— Stephen Hawking, 'A Brief History of Time' (1988)

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Abstract

Purpose: The objective of this study is to examine what are the common practices of green supply chain management in manufacturing companies in Greece and how green management practices can be efficiently implemented along their supply chain in order to achieve a better environmental, economic, operational and social performance. In a globalized market with a growing awareness of an organization's ecological footprint an increasing number of companies worldwide understand the importance to implement green supply chain management (GSCM) practices. Nevertheless, environmental consciousness and environmental protection differ to a wide degree between countries. For Greece and the region of South East Europe there still exists a gap of theoretical and empirical research regarding GSCM. While Greece's business community is largely seen as having a low responsiveness to ecological challenges, this research takes a closer look into the pressures, motivators and impediments that Greek manufacturers experience regarding the implementation of GSCM and how far this can be regarded an opportunity for them to create additional value for their companies.

Research Methodology/Approach: Facing the relative novelty of the subject for Greece and the region of South East Europe and due to the scarcity of information, this research follows a qualitative exploratory research approach. On the base of a thorough literature review the research draws on a number of five in-depth case studies across Greek manufacturing companies. Semi-structured face-to-face interviews are conducted with several key personnel within the companies. The data are triangulated with additional company documents and publications, as well as on the spot observation.

Findings: Findings of this research indicate that Greek manufacturers are generally aware of the ecological challenges but adopt in majority a reactive approach. GSCM does not have high strategic importance. Implementation often lacks vigour. Major drivers are legislative pressure, cost benefits and demands of big customers. Major impediments besides the lack of formal strategy are a mental resistance of employees and partners, and a lack of state support and control. A shift of paradigm is necessary to facilitate a more effective implementation of GSCM measures and foster a multifaceted added value to company performance.

Contribution/Practical implications: This study enlarges the lean body of literature about GSCM implementation in Greece and South Eastern Europe. The findings illustrate to what degree and by which mechanisms Greek manufacturers attempt to incorporate an effective greening strategy into their overall business strategy. The practical motivators and impediments in this effort are exemplified. Progress, shortcomings and possible pitfalls are demonstrated. This research aims to contribute to the understanding of companies in the region of the way of the potential how innovative GSCM practices can increase company value.

Limitations: Restricted by the limited number of case studies in one specific industry sector this research does not make a claim for generalisation of its results but rather provides an insight into a number of current problems that invite further empirical studies.

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List of Abbreviations

BOD	Biochemical Oxygen Demand
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
EC	European Commission
EMAS	Eco-Management and Audit Scheme
EMS	Environmental Management System
EPI	Environmental Performance Index
ESCM	Environmental Supply Chain Management
EU	European Union
GSCM	Green Supply Chain Management
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RoHS	Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
SC	Supply Chain
SSCM	Sustainable Supply Chain Management
VOC	Volatile Organic Compounds
WEEE	Waste Electrical and Electronic Equipment

CHAPTER 1: INTRODUCTION

1.1 Introduction

Since the beginning of industrialisation at the end of the 18th century industrial activity has steadily caused an ever greater demand on the earth's resources and burdened the environment with ever increasing amounts of harmful emissions and waste. The latest figures by the US Department of Energy regarding the global output of carbon dioxide (CO_2) show a bigger increase of greenhouse gases than ever before with 9.5 billion metric tons CO_2 in 2011, as emissions from fossil fuel combustion and industrial processes contribute approximately 78% of the total greenhouse gas emissions increase from 1970 to 2011 (Boden et al., 2015). While the economic perspective of firms' activities were always predominant over the centuries and gradually also concerns about the social dimension related to industrialisation led to some important changes in firms' conduct, distress about the heavy toll on the environment caused by man's economic activity did not reach public interest until very lately. Nowadays there can be observed a worldwide rising awareness in all realms of society of the need to stress also the environmental responsibility of states, companies and citizens. Science explores through research and the development of new technologies possibilities to reduce the use of natural resources and to diminish the production of waste and harmful emissions. A growing body of laws and regulations creates a new legal framework for a more environment friendly strategy of companies throughout all sectors of the economy. This addition of the ecological aspect to the economic perspective seems overdue considering the fact that the world's top 3000 firms cause $2.2 trillion of environmental damage which equals one-third of their total profits (Jowit, 2010).

Companies try to respond to the new pressures coming from law makers, civil society, market forces and various stakeholders with a variety of measures and with varying speed (Zhu et al., 2015). Some businesses achieve to include the green perspective as a major element in their overall business strategy while some others are satisfied to only appear green for marketing purposes. Whereas some firms succeed to

follow a pro-active approach to foresee market demands, others are content to react to the demands once they are inevitably forced upon them (Mohd Rozar et al., 2015). The efforts to contribute with business activities to the maintenance of the ecological equilibrium do not relate only to the new green sectors of the economy, such as alternative energy or water and waste management, but to all economic sectors ranging from manufacturing to the service industry. Thus, a car producer, such as Volkswagen, recognizes the need to get involved in greening its products and processes as much as a bank with its financial services.

As a promising approach for organisations to respond to the call to face their environmental responsibility research and businesses have identified the re-organisation of the firms' entire supply chain in a way that natural resources are conserved and creation of emissions and waste is minimised. Green supply chain management (GSCM) is a modern concept of management practices attempting to integrate environmental thinking into all stages up and down the supply chain (Hervani et al., 2005). These practices entail, among many others, actions such as environmental friendly transportation, product design for reduced consumption of material and energy, and recycling initiatives. Whereas the aforementioned practices relate more to company internal measures, an organisation needs also to reach beyond its boundaries and integrate its supply chain partners to implement green actions, such as green supplier selection or close co-operation with customers for green product specifications.

Since companies nowadays operate in a globalised market environmental performance criteria do not relate merely to the single firm but to its entire supply chain across national borders (Zhu et al., 2005). Puma, the German sportswear maker, for example, realised in an analysis of the company's environmental cost that most of it has been generated with its suppliers located in Asia (Puma, 2011). Organisations with multinational supply chains are forced to deal with the fact that until today the various economies and the companies operating within them have progressed on a very different pace regarding the implementation of appropriate practices and technologies in greening industry products and processes. Countries, such as Greece, with an emerging environmental sensitivity are characterised by a more relaxed implementation of environmental legislation and regulations, less advanced clean technologies and less

sophisticated GSCM practices compared to countries with a more advanced environmental sensitivity (Park et al., 2007).

The necessity to focus on green supply chain management practices particularly in the manufacturing sector is underlined also by the increasingly important role that logistics and supply chain play for that sector in times of the global renaissance of manufacturing and the re-industrialisation of Europe (Heymann et al., 2013) as well as at the dawn of the next phase of industrial development, termed 'industry 4.0' (Kagermann, 2015). Logistics, with the meaning of the broader logistics value chain, has been estimated a € 960 billion market in Europe, representing around 7% of European GDP in 2014 (Kille et al., 2015). As Kilibarda et al. (2013) argue, a large percentage of the total value creation for a company comes from supply chain management.

While still many organisations shy away from the implementation of green measures in their operations due to the fear of related high financial cost, others have recognised the potential of green actions for achieving a competitive advantage in various ways, such as through the related innovation of products and processes or avoiding liability cost for environmental damages. Companies such as Puma realise that besides helping them to live up to their responsibility towards their customers and other stakeholders to create an environmental sustainable value chain the implementation of green measures across their supply chain could also help the firms to avoid future cost increase of raw materials (Puma, 2011).

1.2 Aims and Scope of Research

For the last decade the increasing interest of academia and business in greening the industrial supply chain has led to a large number of researches dealing with a wide variety of theoretical and practical aspects of the subject (Touboulic and Walker, 2015; Gurtu et al., 2015). Despite all the impressive progress done so far still several questions remain regarding the appropriate way of how to approach the challenges in a particular regional and industrial context. Although due to the omnipresent effects of globalisation not any country or company can righteously claim any longer to be able to act

independently as far as the management of its supply chain is concerned, there exist tremendous differences in the speed and in the way countries and companies deal with the issues at hand.

The majority of research on this subject is based on the model of the triple bottom line applying the three dimensions of sustainability: economic, environmental and social. In terms of regional focus most studies on GSCM have been done in Western Europe, the United States of America, Canada, Australia and lately the focus shifted also to Asia and in particular China. In the region of South East Europe the subject of GSCM is still a rather new research development, and there is a gap of theoretical and empirical research for the countries of this research. The inquiry of this thesis aspires to close part of this gap.

The research explores the particular circumstances that define the strategic decisions regarding the implementation of GSCM measures in Greek manufacturing companies. In spite of an apparent ubiquitous concord that green measures are important and necessary for people's health and prosperity many times it seems as though singular actions or packages are implemented without the necessary concern for interconnection and missing a holistic view of the matter. The idea to find the solution through the application of a framework of the style 'one suitable for all', risks neglecting the particular circumstances of the regional or industrial context that can be crucial for a successful implementation of the desired GSCM measures.

For that reason firstly a thorough understanding of the status quo is needed followed by a vision and a definition what should be achieved in the future. Then possible solutions can be evaluated and put into a hierarchical order regarding urgency and feasibility. This procedure may provide a framework for measures that are apt to fit the requirements of existing conditions. For that purpose this research applies a 'bottom-up' approach. Through in-depth case studies a comprehension of people's feeling and thoughts regarding the challenge to implement GSCM measures along the supply chain is achieved. From these insights a framework is constructed that can provide solutions on a basis as close as possible to the conditions given. This framework is then compared to existing frameworks known from research literature in order to

identify methodological shortcomings of existing frameworks, taking into account regional characteristics, and proposing a framework which provides Greek manufacturing companies with a holistic understanding of the potential to implement GSCM measures along their entire supply chains.

Following such a path of research acknowledges the fact that the foundation of both individual and collective conceptualisation is to be seen in people's perception of reality through information and interpretation. Explanations of observed phenomena and the proposition of appropriate solutions for perceived challenges are based on people's personal knowledge and belief, experience and dialogue. Interpretations and behaviour are influenced by the social environment within which organisations and individuals are located. The understanding of reality that we gain in interaction and discourse with other social entities, lead us to our actions as individuals, as organisations and as society as a whole. Thus, this research is conducted with the interest in the social construction of our world that determines the way we make our decisions and act.

Companies facing the challenge of defining a green strategy, still ponder upon the question if this new reality is a costly burden or a market opportunity and if the best answer is to simply comply with existing regulations or to assume a more proactive attitude (Aragón-Correa and Sharma, 2003). One of the crucial criteria for a company to commit itself seriously to GSCM practices is the question how such an approach affects organisational performance and how much added value can be created through it (Bowen et al., 2001).

The objective of this study is to examine what are the common practices of green supply chain management in manufacturing companies in Greece and how green management practices can be efficiently implemented along their supply chain in order to achieve a better company performance. While the primary focus of this research lies on examining the measures to be implemented by the companies with the aim to improve their environmental performance also the resulting positive or negative effects on their operational, economic and social performance as well as on the companies' intellectual capital as part of their potential value creation are examined.

The manufacturing industry has been chosen for its distinctive position in the context of environmental sustainable development. It is often related to as being one of the main causes of many environmental damages (Baldwin et al., 2005). The manufacturing sector is characterised by having big consumptions of energy and producing large quantities of waste. Thus, it has a distinctive impact on the environment. At the same time manufacturers are also exposed to a high degree to changes in environmental regulations and market attitude. Supply chain management plays an eminent strategic role in that industry sector (Preuss, 2005).

The selection of Greece has been made out of the desire to focus on a country in the region of South-East Europe, which is characterised as having an emerging environmental sensitivity and so far has been mostly out of the spotlight of scientific research when it comes to the issues of implementation of green supply management. There are a number of studies dealing with specific aspects of environmental approaches to the supply chain or with reference to particular industry sectors but no study so far has been dealing with the particular subject of implementation of GSCM practices and its consequences for companies' performance in Greece. On the other hand this regional area has been set into the political focus of many latest initiatives of the European Commission for improvement of environmental sustainability issues.

In the pursuit of the objective stated above this research explores what kind of environmental management practices are undertaken by manufacturing companies in Greece in order to improve their organisational performance. The main drivers and barriers of these efforts are examined in order to understand the interaction of intra-organisational and extra-organisational factors which shape the integration of environmental consciousness in the management processes of the supply chain. Industry behaviour and organisational culture in relation to adoption of GSCM practices are scrutinised. The degree of awareness amongst manufacturing companies of the opportunities available to them for developing their business strategy for adoption of green practices in the supply chain is looked at. This inquiry analyses how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing

companies in Greece. Finally, this research makes the attempt to demonstrate how fundamental the successful implementation of green management practices along the supply chain is for future industry performance in the country in focus.

Thus, the main objectives of the study can be described as follows:

1. Evaluate basic concepts of greening strategies for companies' supply chains
2. Determine through thorough examination of literature controversial issues and gaps in existing research
3. Examine on a firm and inter-firm level opportunities and obstacles regarding the implementation of GSCM in Greece
4. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece
5. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimise the effects of impeding factors and to enhance the enabling factors
6. Propose a framework for efficient implementation of GSCM practices that is suitable for companies in an economy of South-East Europe characterized by an emerging environmental sensitivity

1.3 Research Questions

The research questions are designed to identify the process of implementation of GSCM practices in manufacturing companies in Greece and to identify better ways of implementation with the goal of better environmental, operational, social and economic performance. Therefore, the main research questions of the present investigation are:

1. How can the implementation of GSCM practices in Greek manufacturing companies be improved?
2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?
3. Why are GSCM practices fundamental in future industry performance in Greece?

1.4 Research Contribution

This research makes a substantial contribution to the topic of environmental sustainability by contributing to theory in an evolving research area. The study investigates the kinds of environmental management practices that are undertaken by manufacturing companies in Greece in greening their supply chain and how these practices affect the environmental, operational, economic and social performance of these companies. Literature research that has been undertaken in this field which is relatively new in the region of South East Europe shows a wide gap of research in this subject in this particular region. This inquiry intends to contribute to close this gap by scientifically exploring the current situation in the area regarding implementation of green thinking along the supply chain and by suggesting new approaches to help improve the status quo and spark interest in further research also in other countries of the region.

The present research is contributing to the body of knowledge about green supply chain practices in the particular conditions of Greece. Through the comparative analysis of the conducted in-depth case studies this research demonstrates the similarities and differences with the knowledge embodied in previous literature and highlights methodological shortcomings, in particular in regard to the particularities of regional conditions. The quality and richness of the data retrieved from the in-depth case studies opens new questions and illustrates new aspects regarding the effective implementation of GSCM practices based on the particularities arising from the geographical and cultural context of this research. The results of this study are of interest for supply chain professionals and researchers alike. It investigates the importance of a company's focus on environmental concerns and its consequences on the company's overall business strategy and GSCM in a country of emerging environmental sensitivity. It provides a better understanding of the reasoning and motivations of the various actors in the supply chain and of the relationship between them in regard to environmental management and performance. It examines the potential and possible process as well as the obstacles in aligning the greening strategy with the business strategy in a particular business environment.

In terms of theoretical contribution this study aims to broaden the understanding of the situation of GSCM implementation in the region of South-East Europe, in particular in Greece, by analysing current processes and outcomes as well as the main factors for decision making. Based on its empirical approach the study shows the importance of implementation of GSCM practices for future performance of the Greek manufacturing sector. The research develops a framework for a holistic view of GSCM implementation inside the organisation as well as beyond company boundaries in collaboration with supply chain partners on the base of the findings from the case studies. Through the comparison of that framework with other existing theoretical frameworks this study contributes to the improvement of the suitability and applicability of conceptual models to the given particularities of the real life situation for a country with an emerging environmental sensitivity.

In addition, in terms of practical contribution this study aims to contribute to a broader implementation of green practices in companies of the region. It aims to improve companies' understanding of the link between GSCM practices and company performance. Companies will be able to use the insights of the research to implement environmental measures up and down their entire supply chain in order to comply with legal regulations and improve their competitive position by adding value to their organisation. The study is significant as it provides guidelines to Greek manufacturing companies regarding the effective implementation of GSCM practices in order to achieve a better performance.

A limitation of this research is to be seen in the fact that its findings are not tested within the research as the constructs and relationships are induced from the data set. At the end, the results of this study may have limited potential for generalisation, given the focus on a limited number of case studies in a particular industry and a particular country. But future research could test the outcomes in further empirical studies.

Table 1.1 Intended contribution of research objectives to theory and practice

Research Objective	Contribution to Theory	Contribution to Practice	Chapter
1. Evaluate basic concepts of greening strategies for companies' supply chains	How do these concepts relate to the situation in Greece?	Improve companies' understanding of the link between GSCM practices and company performance and assist companies to implement environmental practices along their entire supply chain to become more competitive by improving their performance.	Chapter 2
2. Determine through thorough examination of literature controversial issues and gaps in existing research	Identify questions that have not been satisfactorily answered so far. Identify under-researched areas. Fill the gap of under-researched geographic area of Greece in manufacturing sector.	___	Chapter 2
3. Examine on a firm and inter-firm level opportunities and obstacles regarding the implementation of GSCM in Greece	Particular conditions of Greece. Similarities/ differences with literature findings?	Indication where to look for opportunities and obstacles in practice inside the organisation as well as beyond company boundaries in collaboration with supply chain partners.	Chapter 4
4. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece.	Are problems of Greek companies similar or different to what is described in literature? Analysing the main factors for decision making. Examines the potential and possible process as well as the obstacles in aligning the greening strategy with the business strategy in a particular business environment.	What are the implications for Greek organisations (use of tools and performance indicators)?	Chapter 4

Table 1.1 Intended contribution of research objectives to theory and practice (cont'd)

Research Objective	Contribution to Theory	Contribution to Practice	Chapter
5. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimise the effects of impeding factors and to enhance the enabling factors	Are these success factors identical with existing literature? Spark interest in further research also in other countries of the region with emerging environmental sensitivity.	How can the implementation of GSCM practices in Greek manufacturing companies be improved? Suggesting new approaches to help improve the status quo. Provide guidelines to Greek manufacturing companies regarding the appropriate type of environmental management practices in order to add value to their organisation.	Chapter 5
6. Propose a framework for efficient implementation of GSCM practices that is suitable for companies in an economy of South-East Europe characterized by an emerging environmental sensitivity	Show methodological shortcomings	Contributes to the improvement of the suitability and applicability of conceptual models to the given particularities of the real life situation for a country with an emerging environmental sensitivity. Why are GSCM practices fundamental in future industry performance in Greece?	Chapter 5

1.5 Thesis Outline

The thesis is organised in a way to lead the reader smoothly from one logical step to the next along the following logical thread of the research path, as depicted in figure 1.1. Following the introductory chapter, chapter two presents through a thorough review of literature the current stand of knowledge regarding the major aspects relating to the research topic. This illustration entails the concept of environmental sustainability as well as the rise of green supply chain management as a growing subject of academic and business interest. The theoretical frameworks on which the idea of GSCM is based are explained. In this context also the thematic complexes of performance measurement, green knowledge management and decision making are discussed. The relation of innovation and environmental measures as well as behavioural aspects related to the implementation and practice of environmental actions are examined. The situation in Greece regarding the practice of GSCM is looked at, also with some reference to the recent economic turmoil. Chapter three lays out the methodological approach and the design of the research. Chapter four describes the research findings. The purpose of chapter five is the analysis and discussion of the research findings. Chapter six concludes with summarising the major contributions of the research, considering its limitations as well as proposing further research directions

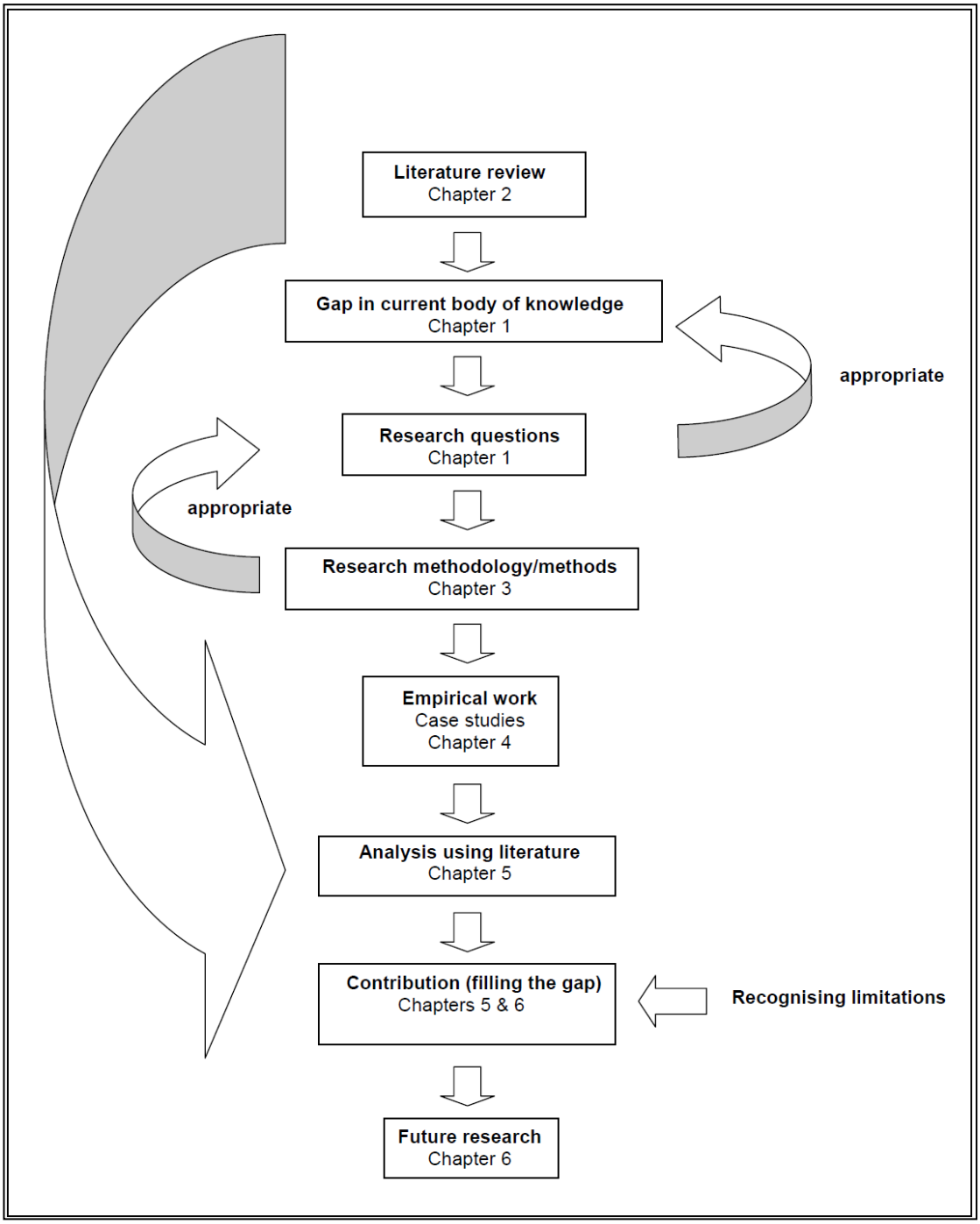


Figure 1.1 Research path

CHAPTER 2: BACKGROUND

2.1 Introduction

Studying the link between business and the environment is not a novel idea. For example, the beginnings of reverse logistics can be traced back to the mid 1970s with research work such as by Guiltinan and Nwokoye (1975). However, green supply chain management has come strongly into academic focus in the 1990s with exemplary works such as by Porter and van der Linde (1995). Various aspects of GSCM have been looked at, entailing, among others, topics such as product and process design (Bovea and Pérez-Belis, 2012; Navin-Chandra, 1994; Dowie, 1994), manufacturing processes (Shrivastava and Shrivastava, 2016; Gupta and Taleb, 1994;) and purchasing (Ji et al, 2015; Green et al., 1996). The subject of environmental performance gained new emphasis due to public and scientific discussion regarding deterioration of the environment, the growing awareness of politics and public, stricter regulatory requirements, consumer and competitor pressures, availability of new technologies and the potential of 'greening' as a competitive advantage (Sarkis, 1999; Faruk et al., 2002; Dubey et al., 2015).

The positive effects of "green" management practices on company performance were laid out in detail by Porter and Van der Linde (1995) and have been a continuous field of research across various industry sectors and geographic regions since then (Diabat et al., 2013). Van Hoek (1999) discusses the value-seeking approach of a corporate strategy by a company taking responsibility of its ecological footprint. Research has also been aiming at such topics as performance measurement of green supply chain management (Sarkis, 2003). Such concepts as green marketing (Stafford, 2003), environment friendly product design (Madu et al., 2002) and greener accounting (Bennett and James, 1997) have been studied. The importance of green purchasing has become a major focus of research (Hutchison 1998). The issues of reverse logistics and the closed-loop supply chain have been studied to quite some length (Govindan et al., 2015; Ferguson and Browne, 2001). Li and Olorunniwo (2008) describe various practices of reverse logistics with a more generic focus while others, such as (Defee et al. (2009) examine more specifically the achievement of a competitive advantage with focus on environmental sustainability through adopting a strategy of a closed-loop

oriented supply chain. Nevertheless the debate regarding the relationship between GSCM and organisational performance remains controversial (Rao and Holt, 2005). This debate relates as much to the effects that green supply chain management can have on the environmental performance of a company (Frosch, 1994) as it does to the potential positive effects on competitiveness and economic performance (Alvarez et al., 2001). The adoption of environmental management systems and the effect on company performance has been given much attention by researchers (Phan and Baird, 2015; Melnyk et al., 2002).

Given this context, it does not surprise that green supply chain management should be studied for its full potential how to be able to contribute to a company's sustainability concept (Schrettle et al., 2014). Businesses have to find 'green' answers to the challenges of limited natural resources, stricter environmental regulations, changed customer demands, competitive pressures and the demand of ethical responsibility. There are many internal and external drivers to compel enterprises to implement practices of green supply chain management ranging from a reactive stand to comply with a changed regulative environment to a more proactive approach seeking to achieve a competitive advantage through the integration of environmentally conscious business practices into the supply chain (Mathiyazhagan et al., 2015; Aragón-Correa, 2003; Ferguson and Toktay, 2006; Sharma and Vredenburg, 1998). Green management practices entail such approaches as eco-efficiency, environmental management systems (Darnall and Edwards, 2006) and cleaner production. For most companies a major focus when thinking of greening their supply chain so far has been the implementation of green purchasing in supply chain management (Min and Galle, 2001). Here the main challenge lies in the better understanding of the importance to align the purchasing strategy with the business strategy. Most of the research in green supply chain management has been undertaken in the private sector, and there in the majority for enterprises of larger size, although some research has been also done for SMEs (Hofmann et al., 2012). Lately, Vachon and Mao (2008) have made an attempt to study supply chain management practices in relation to sustainable development on a country level.

Taking into account the large body of existing literature this research has done a thorough literature review. An overview of the key articles can be found in the taxonomy literature table in Appendix B.

The remainder of this section is divided into six subsections. The first sub-section presents the definition and concepts of GSCM. The second subsection gives information about the drivers for adopting green supply chain management practices and the barriers it faces. The next subsection looks at the role of GSCM in corporate strategy, in particular at the aspect of green purchasing and inter-firm collaboration. The subsequent subsection examines the link between environmental responsibility and company performance. The last subsection provides a short conclusion and summary.

2.2 Green Supply Chain Management

2.2.1 Definition and Aspects of GSCM

While the concept of GCSM, which is also denoted by some researchers as environmental supply chain management (ESCM) or sustainable supply chain management (SSCM), is based on two fields, namely environment management and supply chain management, there is a variety of definitions of GSCM depending on the research subject under consideration (Ahi and Searcy, 2013). So can GSCM primarily comprise the aspect of green purchasing (Preuss, 2005) or in a more comprehensive sense it encompasses the integration of environmental consciousness into all the aspects of the forward and reverse flow of goods and information in the supply chain (Zhu et al., 2005). Generally, the concept can be described as a management approach to link environmental concerns with all stages of the supply chain comprising purchasing material, managing material, product and process design, inbound logistics, production, outbound logistics and reverse logistics (Tseng and Chiu, 2013). Figure 2.1 depicts the scheme of GSCM according to Hervani et al. (2005), who characterize GSCM as a composition of green purchasing, green manufacturing /green materials management, green distribution/marketing and reverse logistics.

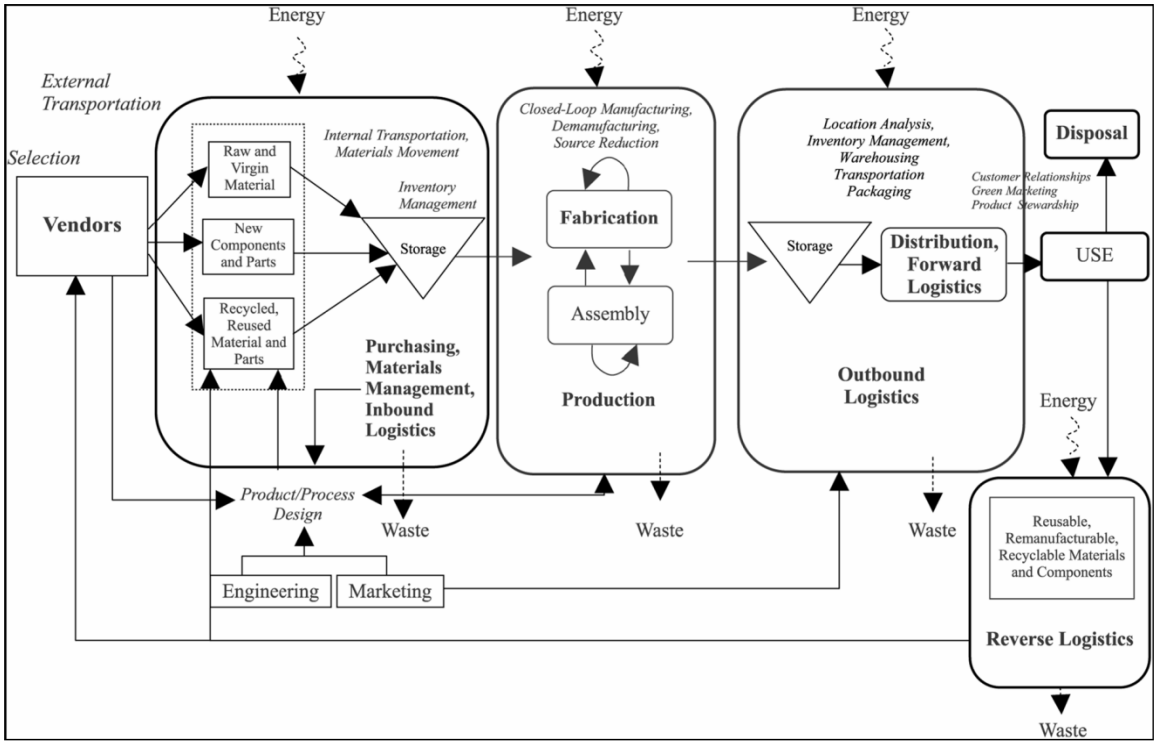


Figure 2.1 Scheme of Green Supply Chain Management
(Hervani et al., 2005)

According to Zsidisin and Siferd (2001, p. 227) GSCM can be defined as "the set of supply chain management policies held, actions taken, and relationships formed in response to concerns related to the natural environment with regard to the design, acquisition, production, distribution, use, reuse, and disposal of the firm's goods and services". Other researchers focus more on individual aspects of GSCM, such as green design which entails the implementation of environmental aspects in all the design issues throughout the product life-cycle (Zhang et al. 1997). Reverse logistics or waste management are also often put in the centre of GSCM (Govindan et al., 2015; Caruso et al.; 1993, Ferguson and Brown, 2001). As shown in figure 2.2, Srivastasi (2007) tries to give a rather comprehensive overview classification of the GSCM elements but blends out some important areas such as green purchasing, industrial ecology and industrial ecosystems, and does not show the various interrelations and interactions between the different aspects. This gap is filled in more recent literature reviews by Fahimnia et al. (2015) and Jaggernath and Khan (2015).

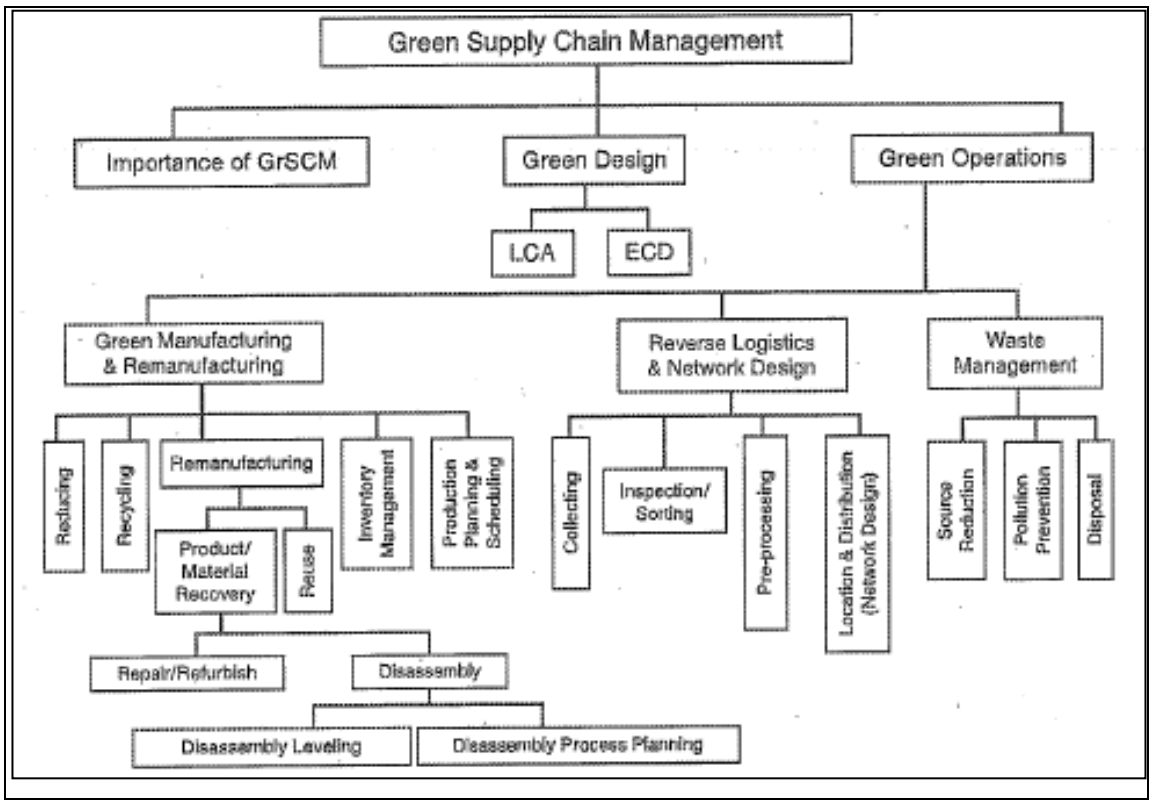


Figure 2.2 Classification of major GSCM topics
(Srivastava, 2007)

Svensson (2007) argues that any definition of GSCM should respect the nature of supply chains as consecutive and interrelated ones, such as supply chains of new products, referred to as first order supply chains, and supply chains prior to the point of origin or following the point of sale of a first order supply chain, labelled second-or n-order supply chains, dealing with, for example, recycling resources.

2.2.2 Role of GSCM in Corporate Strategy

Environmental issues should be considered as an integral part of the business and operations strategy of a company (Nunes and Bennett, 2007) and form a vital part of a company's governance (Formentini and Taticchi, 2016). This applies across all business sectors ranging from car manufacturing (Caniels et al., 2013) to the agrifood sector (Iakovou et al., 2012). The supply chain, in particular one of a manufacturing company, has a strong and diverse impact on the environment. It entails the purchase of raw material and components, adaptations to supplier manufacturing processes or logistics arrangements up to final product disposal and decision about locating supplier plants (Sarkis, 1995). Supply chain management plays an increasing strategic role in

manufacturing companies. The supply function is in control of the largest budget share in most manufacturing companies. This position gives a broad leverage for cost reduction (Klassen and Whybark, 1999). It is also supply that determines the technical and environmental characteristics of goods and parts that enter the organisation (Sarkis, 2001). Thus, the supply function becomes the most crucial element for any environmental initiative in the supply chain (Preuss, 2005). The role of the supply chain manager ranges from deciding about purchase of environment friendlier component to downstream activities, such as product recovery (Rogers and Tibben-Lembke, 2001).

Preuss (2005) shows how the greening effect in the supply chain is not restricted to implementation of environmental standards within the boundaries of the manufacturing company but can achieve a multiplying affect to other tiers of the supply chain, as shown in figure 2.3.

GSCM practices relating to suppliers and customers are concerned with the 'inbound' and 'outbound' aspects of supply chain management. From the 'inbound' perspective of the supply chain it is argued that greening the supply chain brings many

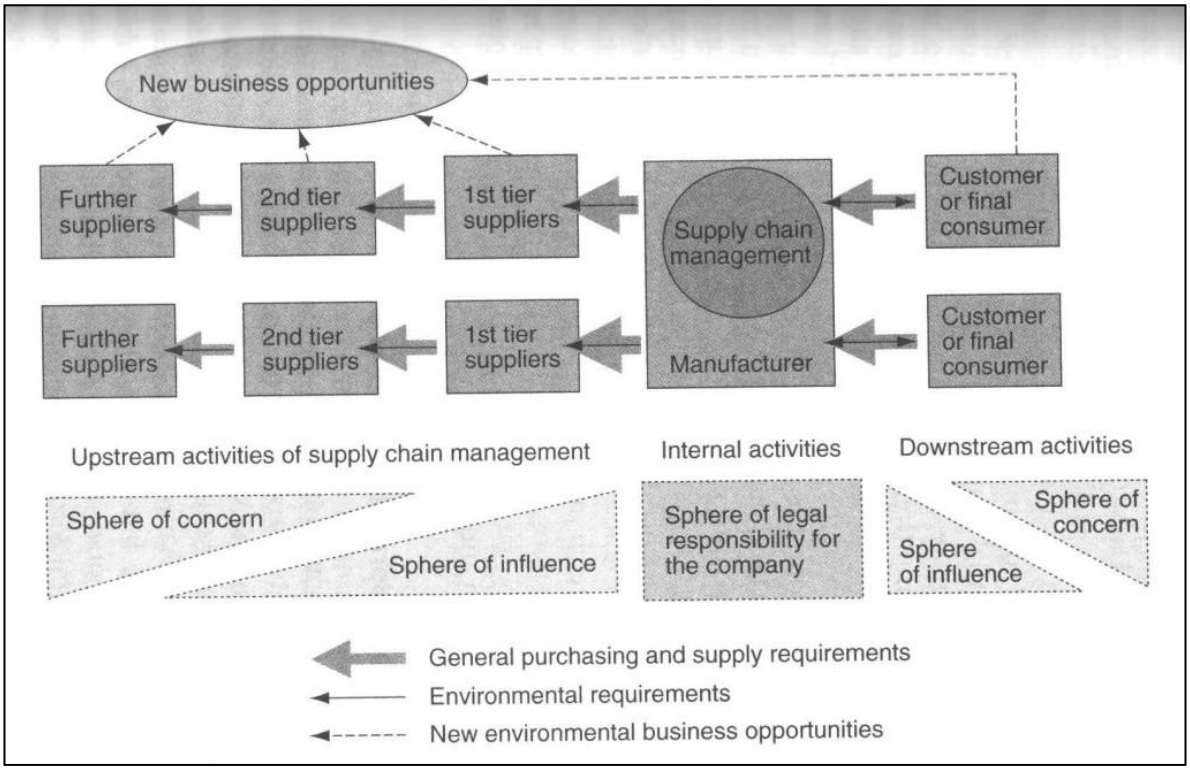


Figure 2.3: Green multiplier effect
(Preuss, 2005)

advantages to an organisation. The company is able to cut costs and include its suppliers in an interactive decision making process that fosters innovative environmental measures (Bowen et al., 2001b, Rao, 2002). As Min and Galle (2001) argue, as reaction to the increasing global pressure to implement environmental friendly practices in their supply chain many companies focus on greening the purchasing strategies in their inbound function. Investigating the integration of suppliers into the decision making process of GSCM basically two trends can be seen according to Walton et al (1998). Companies increasingly understand that they will be held accountable for the impact of their business operations on the environment and therefore start to incorporate environmental concerns into their overall business strategy. Secondly, improvement of customer service and realizing cost efficiencies are additional incentives for supply chain integration. The way that companies attempt to implement green purchasing strategies is twofold, namely the evaluation of suppliers' environmental record and, in parallel, to help them improve their environmental behaviour. The tools and techniques available for green supplier selection have been described in detail by authors, such Noci (1997) and Rao and Holt (2005). As part of the greening process in the inbound function supplier are often encouraged by their bigger clients to implement an environmental management system in-house and adopt environmental accreditation standards, such as ISO 14001 (Preuss, 2005).

Greening the outbound function, on the other hand, entails according to Rao and Holt (2005) and Zhu and Sarkis (2006) green supply chain management practices, such as green packaging, green marketing, and environmental friendly distribution. Zsidisin and Sifred (2001) describe the various purposes of packaging as follows: protection, containment, preservation, unitization, apportionment, and presentation. In order to address the environmental aspect of packaging green actions aim to use more environmental friendly packaging material and to reduce the overall amount of packaging (Vachon and Klassen, 2006). Already Van Hoek (1999) refers to taking back packaging material as an effective form of reverse logistics. Also GSCM practices, such as the use of standardized reusable containers and transparency and availability of information, can help to reduce storage space, delays in material collection and, in consequence, also to save costs (Zhu and Sarkis, 2006).

Green product and process design can also play an essential role in reducing waste. This concept refers to practices, such as environment friendly raw material, design for reduced consumption of material and energy, use of cleaner technology processes to reduce solid and liquid waste and use of reverse logistics (Preuss, 2005). According to Albino et al. (2009) corporate environmental management strategies have refocused on green product design along with the corresponding environmental policies by the European Commission and other bodies.

2.2.3 Drivers

When thinking about the crucial success factors for effective implementation of GSCM practices the question comes to the motives for companies to assume corporate ecological responsiveness. A better understanding of the drivers that make companies go green would enable researchers, policy makers and managers to predict ecological responsiveness and to determine the relative efficacy of command and control mechanisms, market measures, and voluntary measures (Vredenburg & Westley, 1993). Possible drivers for enterprises to implement green management practices along their supply chain entail regulatory compliance, competitive advantage, stakeholder pressures, ethical concerns, critical events, and top management initiative (Winn, 1995). As Zhu and Sarkis (2006) found out, drivers can differ for companies in different industries.

According to Walker et al. (2008) the drivers can be grouped into two main categories, namely internal drivers and external drivers. Preuss (2005) finds three major groups of determining factors for implementing green supply chain management practices: social pressure, economic factors and cultural values, as shown in figure 2.4.

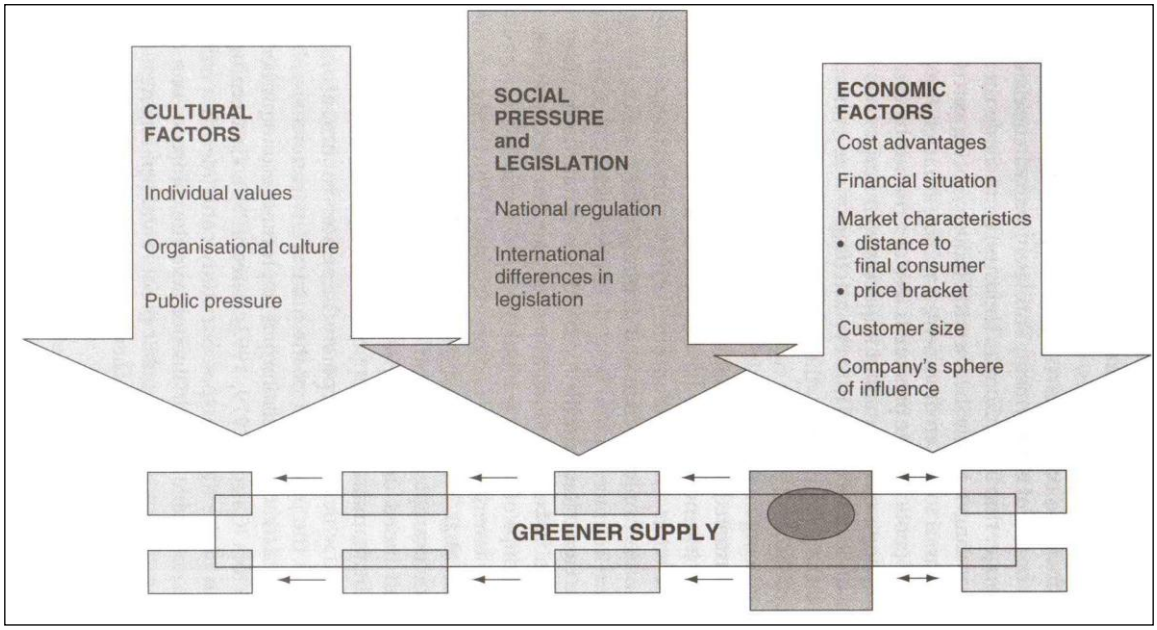


Figure 2.4: Major drivers for adoption of GSCM practices
(Preuss, 2005)

Bansal and Roth (2000) go beyond the pure identification of drivers for ecological responsiveness in firms and create an advanced model for explaining the relationship between a firm's green initiatives and the underlying motivational factors, while also identifying the contextual dimensions which influence these motivations, as illustrated in figure 2.5. Nevertheless, their study falls short to explain the relative efficacy and prevalence of the identified contexts and motivations. Nor does the model take into account the influence of cultural dimensions on a firm's ecological response. Lo and Shiah (2016) reveal in a recent study the moderating influence of the various environmental uncertainties, such as supply, competition and demand uncertainty, on a company's readiness to adopt GSCM practices.

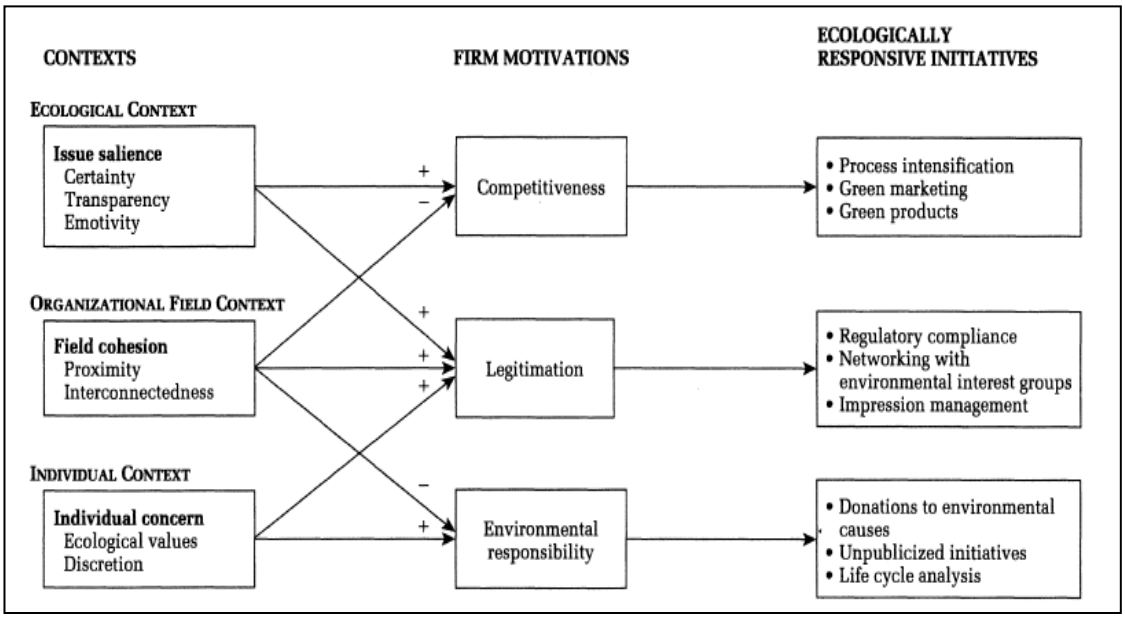


Figure 2.5: An advanced model of corporate ecological responsiveness (Bansal and Roth, 2000)

2.2.3.1 Internal Drivers

Personal commitment of individuals is an important internal driver of GSCM adoption (New et al., 2000; Hanna et al., 2000). The personal motivation of an employee can range from intrinsic reward (Drumwright, 1994) to improving one's own position within their company (New et al., 2000). Another internal motivation of a company is the wish to minimize costs (Green et al., 1996; Handfield et al., 1997). Throughout a product's life cycle, pollution reflects hidden costs in the form of wasted resources and effort. Thus a company can reduce costs by implementing the concept of pollution prevention through such methods as material substitution and closed-loop processes (Porter and Van de Linde, 1995). Pressure from investors can be seen as an at least partly internal driver (Green et al., 1996; Trowbridge, 2001). Walker et al. (2008) view credibility, reputation risk and public embarrassment as other internal factors.

2.2.3.2 External Drivers

There are a large number of external factors that can motivate a company to implement green supply chain management practices. Among the major external drivers researchers find government regulation and legislation (Beamon, 1999). Here literature differentiates between companies' reactive and proactive modes and sees a more

successful adoption of GSCM activities in the latter case combined with innovative measures (Bowen et al., 2001a; Carter and Dresner, 2001). Meixell and Luoma (2015) observe a generally positive effect of stakeholder pressures on companies' environmental performance but to a varying degree depending on the type of stakeholder. Green et al (1996) identify an organisation's customers as one such driving force. The customers can be under pressure from the end-consumers (Handfield et al., 1997). Hall (2001) demonstrates that especially small companies are under pressure from their customers. The degree of a company's environmental visibility can be seen as often positively related to the amount of pressure they face to adopt green practices (Bowen, 2000). A firm's competitors may drive its ecological responsiveness by motivating it to achieve a better competitive position through ecological technological leadership (Henriques and Sadorsky, 1999), development of special competencies in implementation of GSCM practices (Sarkis, 2003) or better economic performance (Rao and Holt, 2005).

With the increased public awareness of environmental problems society has also changed its expectations of what companies should do to take ecological responsibility. Responding to the pressure from environment-oriented pressure groups plays an increasing role in a firm's strategy decisions (Hall, 2001; Trowbridge, 2001). Society's changing attitudes are reflected in customers buying behaviour when going for the 'greener' product in such terms as environmental friendly production methods or choice of suppliers (Chan and Lau, 2001). While suppliers usually are not considered a motivation factor by themselves (Carter and Dresner, 2001), their successful integration into a firm's supply chain management can result in the company's improved environmental performance (Vachon and Klassen, 2006).

2.2.4 Barriers

The literature review shows that studies of barriers of GSCM implementation are less numerous than studies of its drivers. There seem to be more internal barriers than external (Walker et al., 2008). Some of the factors characterized as drivers in the above chapter may also be considered as barriers in other contexts (Porter and Van de Linde, 1995). Al Zaabi et al. (2013) point out in their study on Indian fastener

manufacturers that not all barriers have the same degree of impact on a company's readiness to adopt GSCM.

2.2.4.1 Internal Barriers

One of the strongest barriers to GSCM is the concern about related high costs (Min and Galle, 2001). This is even more the case when referring to firms of small and medium size (Hervani et al., 2005). The problem seems to be persistent especially when a company sees economic and environmental gain as incompatible (Bowen et al., 2001b). Another strong barrier is the lack of commitment due to the belief of many companies and their top management that environmental concern is still not something that has to be given serious attention (Min and Galle, 2001). Also a company's situation in regard to the lack of required technology can often hinder the implementation of desirable green measures, as for example in the case of technology designed for big companies rather than for SMEs (Studer et al., 2006).

2.2.4.2 External Barriers

According to Klassen and Vachon (2003) the unwillingness of different supply chain members to co-operate and to exchange information that they would consider confidential can often be a major barrier to implement efficiently GSCM. A lack of customer demand for green products can be a hindrance for implementation of green measures (Studer et al., 2006). Missing environmental regulation and a lack of government incentives and support can be preventing the adoption of GSCM (Porter and Van de Linde, 1995). Lack of public infrastructure such as recycling and waste management facilities can also pose a problem for successful implementation of environmental measures inside a company. In an inter-sectoral comparison of green supply chain management in China Zhu and Sarkis (2006) find barriers can be industry specific, as for example due to the lack of sector specific guidance.

2.2.5 Practices of GSCM

2.2.5.1 Inside Company

Several researchers have emphasized how much a company's overall impact on the environment depends on the purchasing function and the important role it plays in a company's strategy (Handfield et al., 1997, Green et al., 1998). Carter et al. (2000) rightly point out the prominent position of the purchasing function at the beginning of the value chain and its potential to add to a company's overall environmental strategy. When a company decides to use its purchasing function as a strategic tool it can leverage it to implement various GSCM measures within and beyond company boundaries (Cousins et al., 2004). Thus, giving high importance to greening the purchasing function would lead to a higher appreciation of the company's environmental strategy by all other stakeholders within the company and by outside supply chain partners. According to Walton et al. (1998) this can result in consequent measures within the company, such as training the purchasing staff on green supplier selection and evaluation, developing programmes for reducing waste as well as environmental programmes for green design that can also involve suppliers (Carter et al., 2000).

Important for the implementation of a successful green purchasing strategy, as for the development of all other internal GSCM practices, is the appropriate training of staff in environmental matters in order to achieve the required expertise and motivation. (Carter et al., 2000; Jabbour and de Sousa Jabbour, 2016).

Other GSCM practices in the inbound function can refer to environmental friendly internal transportation (Chien, 2007). In the production function it can mean measures, such as reduction of raw materials and consumables (Corbett and Klassen, 2006) as well as use of energy efficient machinery (Mitra and Datta, 2014), and in the outbound function environment friendly practices can be implemented in regard to smart inventory management and warehousing (Veleva et al., 2001), emission reduced transportation (Zhu et al., 2007) and green packaging (Zhang et al., 1997).

Another aspect of possible implementation of GSCM practices in business operations is the effective use of 'green' information and communication technologies

(ICT) in “improving the efficiency of existing products and processes” or “using ICT to build green innovation” as described by Andreopoulou et al. (2014, p. 14).

2.2.5.2 Beyond Company Borders

In their aim to develop environmental friendly supply chains companies cannot only focus on implementing GSCM measures inside their organisation but need to extend their focus beyond their own boundaries. While researchers have examined the subject of how organizations create relational competencies in order to gain a sustainable collaborative advantage (Dyer, 2000) the issue at hand is how they can implement green management practices in cooperation with their partners up and down their entire supply chain in order to achieve also ecological sustainability (Vachon and Klassen, 2006). Also the firm’s environmental relationship with other stakeholders outside of the company boundaries plays an important role (Harvey and Schaefer, 2001).

Companies need to take into account the fact that critical resources and competences for achieving their goal of a green supply chain stretch beyond their own boundaries and they need to develop good ways of cooperation with their various suppliers and customers in order to be able to manage these assets in an efficient way to achieve environment friendly results (Bowen et al., 2001b). Close and long-term relationships with supply chain partners will help businesses to develop innovative green technologies, joint environmental research and development and regular information and know-how exchange that can lead to better environmental and economic results (Cheng et al., 2008).

Establishing a trustful and close long-term relationship with a restricted, carefully selected, number of suppliers can enable a company to implement effective strategies for reducing waste, such as just-in-time and continuous improvement (Zhu and Sarkis, 2004). Carr and Pearson (1999) have shown that such relationships of superior quality result in a better economic performance of a company. Guimares et al. (2002) confirm such a positive relation. To make suppliers in such a way a fully integrated part of a well-managed supply chain will make the entire supply chain more competitive (Kotabe et al., 2003). According to Geffen and Rothenberg (2000), long-

term and superior relations with a limited supplier base can also help the partners to adopt and develop innovative environmental technologies more easily. In a more recent study Dubey et al. (2015) confirm that good supplier relationship management including the principles of total quality management can have a positive effect on a company's environmental performance under the influence of supportive leadership and institutional pressure. Luthra et al. (2016) propose a framework for efficiently identifying and applying sustainable supplier selection criteria.

As Theyel (2006) explains, there exist three possible ways how suppliers and buyers can influence each other along the supply chain. They can share information regarding environmental requirements, such as ISO-14000 certification, purchasing requirements and needs for employee training. They can exchange environmental information by giving new product samples, forwarding regulatory updates and discussing best practices. They can also improve environmental aspects of products and processes by sharing personnel and equipment to collaborate in the development of recyclable products and the creation cleaner processes.

According to Hamner (2006) companies can apply a set of different elements in their strategies for green purchasing, as shown in figure 2.6.

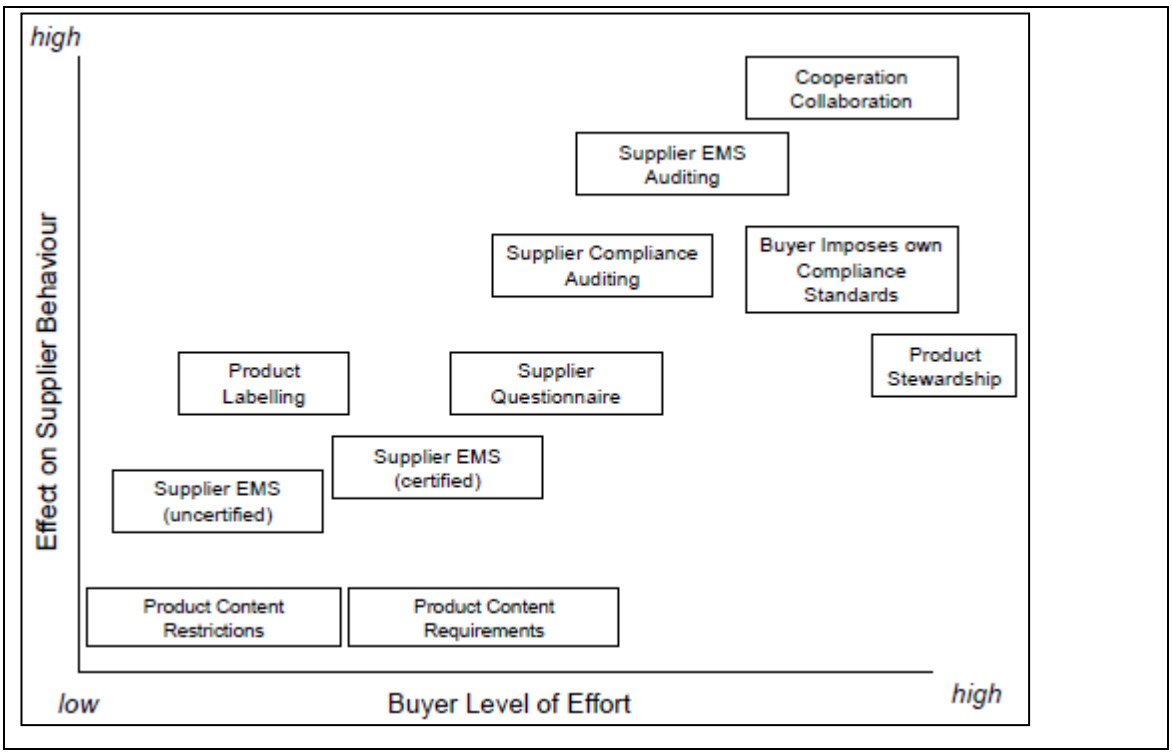


Figure 2.6: Green purchasing strategies
(Hamner, 2006)

A close relationship means that supply chain members share information, risks and rewards, can fully rely on each other, and are willing to maintain the relationship over a long time (Guimaraes et al., 2002). A lack of information can be a major limitation to green supply chain efficiency, whereas firms might use strong informational relationships to facilitate inter-firm learning and improve environmental performance for all parties involved (Cheng, 2008). This sharing into green supply chains might be of varying difficulty for different types of companies. So examines Lee (2008) for example the possible drivers and impediments for SME suppliers to participate successfully in green supply chains.

A variety of initiatives have been created for making the process of supply chain management more environmentally conscious. Among such initiatives Min and Galle (2001) name the screening of suppliers for environmental performance as well as strategies for source reduction promoting recycling of waste. Walton et al. (1998) mention the provision of training to foster the environmental management capacity of suppliers. Zhu and Sarkis (2004) refer to the development of investment recovery. According to Zhu and Cote (2004) another initiative could be the implementation of reverse logistics systems that can help to recover packaging and products to be re-used and remanufactured.

Ragatz et al. (1997) argue that through effective implementation of inter-firm communication companies can achieve such advantages as sourcing material of better quality and at lower cost, decreasing time for product development, and gaining better access to innovative technology and applying it at reduced cost. Simpson et al. (2005) show in their study about the Australian automotive industry that good inter-firm collaboration can lead to better environmental performance of companies.

According to Lamming and Hampson (1996) there exist a number of possible instruments to better enable supply chain partners to implement GSCM, such as life-cycle analysis, environmental management systems, extended producer responsibility, questionnaires and institutionalisation of cooperation.

For the successful implementation of GSCM practices beyond the company boundaries the same important factor holds true as for the establishment of green measures within the company, namely that they are integrated in an environmental strategy that is in accordance with and an equally strong part of the overall business strategy of the company (Paulraj and Chen, 2005; Handfield et al., 2005).

2.2.6 Green Knowledge Management

In order to adopt a more environment friendly strategy, companies need to gain the relevant knowledge of how to implement the appropriate possibilities for product and process alteration (Chen, 2008). Knowledge can be defined as a combination of various ingredients such as experience, expert insight, values, and contextual information, which sets a base for assessing and integrating new information and experiences (Davenport and Prusak, 1998). Intellectual capital results from the management of knowledge flows. So can Stewart (1997) define intellectual capital as the mixture of knowledge, information, intellectual property and experience, which can be exploited in order to generate wealth. Environmental capital is part of intellectual capital (Claver-Cortes et al., 2007). According to Chen (2008, p.277), green intellectual capital is the "total stocks of all kinds of intangible assets, knowledge, capabilities, and relationships, etc. about environmental protection or green innovation in the individual level and the organisation level within a company".

According to the most common classification of intellectual capital also green intellectual capital can be subdivided into green human capital, green structural capital, and green relational capital (López-Gamero et al., 2010). Human environmental capital refers to the ecology-concerned knowledge and skills of a company's employees relating to either operational capabilities or emotional commitment (Claver-Cortes, 2007). Structural environmental capital is formed by organisational capabilities developing the company's environmental management and technological capabilities concerning the development and implementation of environment friendly products and processes. The third dimension, relational environmental capital, refers to the company's relationships with its stakeholders and the market in which it operates, regarding environmental issues (Baresel-Bofinger et al., 2011a).

2.3 Theoretical Frameworks

2.3.1 Introduction

When discussing GSCM researchers draw on several theoretical frameworks. These theories will be explained in this section. This study will refer to relevant existing theoretical frameworks to compare its own findings and conclusions but will generally assume an inductive strategy, as explained further down in chapter 3.3. Generally, a theoretical approach can be characterized by the respective explanandum, representing the phenomenon to be explained, and the explanans, made up of regularities and antecedents (Vagt, 2007).

Literature shows several ways how research has attempted to theoretically connect operations of business organisations with the natural environment. Gladwin et al. (1995), confronting the 'technocentric' belief that growth has no limits and science and technology can solve all environmental problems with the opposing 'ecocentric' idea that growth is indeed limited and the earth has a limited capacity of resources, suggested a paradigm shift towards a 'sustaincentric' concept, which proclaims that companies should follow the broader principles of sustainable development, as postulated in the report of the World Commission on Environment and Development (WCED, 1987).

Another approach is referring to managerial stakeholder theory arguing that a business should be obliged to accommodate the interests of all its stakeholder groups, including the natural environment (Driscol and Starik, 2004). However, problems exist in the definition of who or what constitutes a legitimate stakeholder (Mitchell et al., 1997). Moreover, balancing competing stakeholders' interests might be a very difficult if not totally impossible demand on businesses (Sternberg 1996).

A different line of research proposes to focus on the integration of environmental considerations into the strategic planning process of the firm linking it to firm competitiveness and profitability (Judge and Douglas, 1998). This view assumes that integration of environmental consciousness in business strategy can provide sustained competitive advantage.

The following subsections will look in some more detail at a few theoretical frameworks relevant to GSCM. Starting from the classical approach of the resource-based view of the firm, also the competence-based view will be discussed. The relational view of collaborative advantage will be looked at as yet another possible approach undertaken by researchers of GSCM practices. Then the stakeholder approach towards adopting a corporate environmental strategy will be examined. Finally, a short summary and conclusions will be presented.

2.3.2 Resource-Based View of the Firm

Three competing theories of firm performance have been proposed in the business strategy literature, the industry structure view, the resource-based view and the relational view of the firm.

The resource-based view of the firm is a common approach when it comes to the discussion of the effect of environmental strategies on a company's environmental and economic performance (Rugman and Verbeke, 1998). The resource-based view (RBV) of the firm (Barney, 1991) provides a theory to explain competitive advantage as an outcome of the development of valuable organisational capabilities, such as continuous innovation, organisational learning, and stakeholder integration, associated with a proactive environmental strategy (Hart, 1995). This approach argues that differential firm performance is fundamentally due to firm heterogeneity rather than industry structure (Rumelt, 1991).Firms that are able to accumulate resources and capabilities that are rare, valuable, non-substitutable, and difficult to imitate will achieve a competitive advantage (Russo and Fouts, 1997). According to the resource-based view of the firm, the source of a firm's sustainable competitive advantage is the bundle of organisational resources that are not tradable in strategic factor markets, that take a long time to develop and are historically based and path dependent, and that entail socially complex relationships with other organisational resources (Reed and DeFillippi, 1990). Further, sustainability of competitive advantage is enhanced when it is difficult to decipher causal relationships between organisational capabilities and outcomes (Lippman and Rumelt, 1982).

Resource-based studies have investigated the organisational resources and capabilities that link environmental strategy and organisational performance (Sharma & Vredenburg, 1998). For example, Christmann (2000) showed that complementary process capabilities contributed to cost advantage when a firm implemented best practices for environmental management. Chan (2005) raised the question if the natural resource based view can be applied also in emerging economies. Lewis (2000) expressed his doubts that the classic approach of the resource-based view might be too limited to assess the complex interrelationships between environmental strategies and company performance.

Based on the resource-based view, Hart (1995) developed four types of environmental strategies: (1) the 'end-of-pipe' approach, (2) 'pollution prevention' or 'total quality management', (3) 'product stewardship', and (4) 'sustainable development.' Hart also recognized the interconnectedness among different stages as a result of path dependencies. In order to move from one strategic stage to the next in terms of environmental pro-activeness a particular required sequence of resource accumulation in various individual resource domains has to be fulfilled (Hart, 1995.) Buysse and Verbeke (2003) identify these five domains as the following: (1) investments in conventional green competencies related to green product and manufacturing technologies; (2) investments in employee skills; (3) investments in organizational competencies, deriving from such areas as R&D and product design, finance and accounting, among others; (4) investments in formal management systems and procedures; and (5) efforts to explicitly include environmental issues in the corporate strategic planning process. Guang Shi et al. (2012) make an initial attempt to show the causality of RBV and GSCM with drivers and performance measures.

2.3.3 Competence Based View

The competence based view, developed among others by Hamel and Prahalad (1994), and Sanchez et al. (1996), is a theory of sustaining competitive advantage and a quite dominant framework in strategic management (Barney, 2001). The theory originated from the resource-based view but developed into an independent theoretical perspective. While offering management theory a framework of high relevance in order to explain the roots of corporate success, the contributions to organisation theory are

still to be analyzed more comprehensively. In particular, answers are required how far the competence-based view offers a comprehensive theory of the firm. The competence-based view goes one step beyond the resource-based view. While the resource-based view suggests that a firm is more successful than another firm if it controls more effective and/or efficient resources than the latter one (Hunt 2000), the competence-based view states that in order for a firm to be more successful than another firm the former has also to be in the position to make use of the available resources more effectively and/or efficiently than the latter one (Freiling, 2004). This goes along with the availability and the usage of competences which cannot quickly be imitated respectively substituted by rivals (Teece et al. 1997).

A key difference between the resource- and competence-based views is the chain of causality: Whereas the resource-based view concludes that superior resources will cause performance differences among firms, the competence-based view prefers a more subtle reasoning. Homogeneous assets and heterogeneous resources are the starting point of the chain. However, the resource endowment is not enough in order to explain performance differences. The firm itself has to be in a position to make use of these resources in a goal- and market-oriented way. This is only possible in case of available action-related competences. They unfold the potential of resources and enable the firm to adapt to the requirements in target markets instantly in a non-random manner. Competences fill the explanatory gap between idiosyncratic resources and performance by considering both "asset flows" and activities (Dierickx and Cool 1989).

Following Hunt (2000), there is another reason why the competence-based perspective goes beyond the resource-based view by closing an explanatory gap of the latter. The causal extension of the resource-based view resides in the explanation that it takes competences in order to build resources by asset refinement processes. All in all, compared with the resource-based view the competence perspective offers new conceptual dimensions which capture more aspects of the complex and dynamic interplay of assets, resources, and competences (Sanchez, 2001).

Regarding the relationship between the market and the firm, the views differ slightly. The resource-based view is sometimes understood as an inside-out approach. Barney's (2002) framework clearly suggests that resources can only be of strategic

importance if they are able to produce value which is only possible in case of market orientation. Although planning starts with identifying the strengths of the corporation, the way of thinking follows the other way round. The same holds true for the competence-based view with the single exception that market-oriented thinking plays a more prominent role: Competences are the important means in order to bridge potential gaps between the market and the firm. Moreover, firm-specific competences do not necessarily refer to internal resources. Oppositely, the competence-based logic acknowledges the phenomenon of open boundaries (Madhok, 2002) by touching on the necessity to combine firm-addressable and firm-specific resources in order to attain the goals (Sanchez andHeene 1997). This gives rise to the impression that sustaining competitive advantages very often rest on the assets of a network of firms and, even more, on blending own capabilities with the ones of partner firms (Lorenzoni and Lipparini 1999).

2.3.4 Relational View of Collaborative Advantage

The relational view is a view which suggests that a firm's critical resources may span firm boundaries and may be embedded in inter-firm resources and routines—that idiosyncratic inter-firm linkages may be a source of relational rents and competitive advantage (Dyer and Singh 1998). According to the RBV, an individual firm should attempt to protect, rather than share, valuable proprietary know-how to prevent knowledge spillovers, which could erode or eliminate its competitive advantage. However, an effective strategy from a relational view may be for firms to systematically share valuable - even proprietary - know-how with alliance partners in return for access to the stock of valuable and proprietary knowledge which resides within its alliance partners. Of course, this strategy makes sense only when the expected value of the combined in-flows of knowledge from partners exceeds the expected loss/erosion of advantages due to knowledge spillovers to competitors. Competitive advantage arises when a firm owns or controls a resource that exhibits four characteristics. The resource must be valuable, rare, imperfectly imitable and non-substitutable (Barney, 1991).

The rapid growth of collaborative relationships across industries has encouraged a focus beyond the earning capacity of resources controlled by a single firm, to recognition of the revenue generating potential of resources that lie beyond a firm's

boundaries. Collaborative advantage arises when a firm is able to extract business benefits from the resources of its' strategic partners. Collaborative advantage is thus different to competitive advantage, (although the former may give rise to the later). Collaborative advantage requires a long-term orientation and may produce revenue that can only be realised through working jointly. Such revenue is termed 'relational rents'. The ability of the firm to derive relational rents is at least, in part, dependent on how effective the supply function is in building and leveraging collaborative partnerships with suppliers. Strategic purchasing and supplier relationships become critical competitive resources. Within the collaborative paradigm, the business world is composed of a network of interdependent relationships developed and fostered with the goal of deriving greater and mutual benefits (Chen and Paulraj, 2004).

A number of researchers use this approach of collaborative advantage to demonstrate how firms need to develop along with their green supply management also their relational capabilities in order to improve their environmental and economic performance (Dyer, 2000; Handfield et al., 1997).

2.3.5 Stakeholder Approach

The concept of 'stakeholder' has been defined by Freeman (1984) to include any individual or group who can affect the firm's performance or who is affected by the achievement of the organization's objectives. Although since its beginnings the concept of stakeholder has been expanded in various directions, the existing literature can be broadly divided into a strategic and a moral branch (Frooman, 1999). While the strategic stakeholder literature gives emphasis to the importance of actively managing stakeholder interests, the moral stakeholder literature focuses mainly on the need to balance various stakeholder interests (Frooman, 1999). Stakeholders are defined according to the type of relationship they have with the company. Primary stakeholders refer to individuals and groups that maintain formal relationships with the organization, such as suppliers, customers, employees, and public agencies. Secondary stakeholders refer to groups that do not engage in formal transactions with the company, such as the media and special interest groups (Clarkson, 1995). Another classification by Michell et al. (1997) is based upon the three attributes: power, legitimacy, and urgency. Jawahar

and McLauglin's (2001) argue that managers are likely to use different strategies to deal with different stakeholders and that these strategies may change over time.

The modern stakeholder management approach argues that strategic management decisions should follow broader objectives and address the expectations and interests of a wide variety of stakeholders (McGee, 1998). Such objectives may entail, among such issues as customer satisfaction, regulatory compliance and good corporate citizenship, also particularly social and environmental responsibility (Henriques and Sadorsky, 1996). It is argued that poor environmental performance can damage a company's relationship with its stakeholders (Shrivastava, 1995). For example, shareholders may consider companies with a bad environmental image a riskier investment and in return may demand a higher risk premium or even withdraw their funds altogether (Henriques and Sadorsky, 1996). Environment conscious consumers may prefer products of other companies with a better environmental record (Chan and Lau, 2001). Employees may prefer to work in an organisation with a greener attitude (Sharma and Vredenburg, 1998). Green suppliers, concerned about their own environmental reputation, may choose to stop cooperation with a company that has a weak environmental performance (Henriques and Sadorsky, 1999).

Thus, there seems to be an increasing need for firms to rethink their corporate strategy in terms of including values regarding the protection of the environment (Buysse and Verbeke, 2000). A new value-based business approach, termed 'stakeholder capitalism' or 'values-based capitalism', is to be built upon the concept of environmental innovation: 'if we understand capitalism as a system of cooperation among stakeholders around important values, and if we understand businesses as being driven by enterprise strategy, then there are no limits for greening of enterprise strategy' (Freeman *et al*., 2000, p.32).

2.4 Company Performance

There is a rich literature on supply chain performance measurement in regard to mostly economic and environmental aspects, as Beske-Janssen et al. (2015) describe in their comprehensive overview. Nevertheless research of the relationship between GSCM and organisational performance has so far produced non-conclusive results

(Green et al., 1998). There exist two contrasting views about the relationship between environmental practices and organisational performance. The first viewpoint argues that many managers believe that environmental management consists simply of compliance with regulations, and that a trade-off exists where increased level of environmental management results in increased cost (Walley and Whitehead, 1994). This relationship might exist in part due to increased costs associated with the transference of externalities, such as the cost of polluted air, back to the firm (Klassen and McLaughlin, 1996). Barbera and McConnell (1990) studied the effect of abatement capital on industry productivity and found that abatement capital was responsible for a decline in productivity. Gallop and Roberts (1983) studied the effects of environmental regulations on the cost of operations in the electricity utilities industry and found a similar effect - environmental regulations were associated with a decline in industry productivity. There is also a body of research that suggests a positive relationship between environmental practices and organisational performance (Mitra and Datta, 2014; Choi and Hwang, 2015). Other researchers, such as Pagell and Shevchenko (2014) argue that there are still too many unknowns to take either side.

Based on the basic premise of 'competitive advantage' (Porter, 1985), firms can improve their environmental performance only at the cost of some profit-enabling capability or resource. Nevertheless, the ongoing ecological deterioration of the environment seems to make it an imperative for companies to define competitive advantage within a broader scope of social legitimacy and to adopt a wider understanding of the coexistence and interrelationships between the conflicting factors (Lewis, 2000). The theoretical perspective of 'ecological sustainability' has emerged as a means for simultaneously dealing with economic and ecological problems (Shrivastava, 1995). According to this concept, organisations can benefit by reducing costs through ecological efficiencies, capturing emerging green markets, gaining first mover advantage, ensuring long-term profitability, establishing better community relations and improving their image, and ultimately gaining competitive advantage (Porter and Van der Linde, 1995).

Organisational performance can be improved through many different pathways (Kirchoff et al., 2016). Rangone (1999) suggests that SMEs can realize a competitive advantage from three basic capabilities: innovation (the development of new products

and processes), production (optimization of product production and delivery) and market management (sales and marketing, including a green image). Rao and Holt (2005) have a similar view, measuring competitive advantage by a company's ability to improve efficiency, quality and productivity, and to realize cost savings.

Environmental improvements have the potential to affect these competitive elements (Hart and Ahuja, 1996). Sharma and Vredenburg (1998) highlight three competitive capabilities derived specifically from an environmental commitment: stakeholder integration (the ability to involve external stakeholders in finding solutions to environmental problems), higher-order learning from having a different perspective on existing procedures, and continuous innovation because of a richer learning process. Azzone and Noci (1998) suggest that proactive environmental performance may become a more important factor in increasing competitiveness in the long run as environmental requirements evolve.

Since environmentally oriented buyer-supplier initiatives require large capital, it is essential to guarantee that they will subsequently lead to superior environmental as well as economic performance. Researchers support the notion that close relationships with suppliers, characterized by trust and commitment, long-term partnership agreements, and joint research and development will lead to improvements in environmental performance (Florida, 1996; Geffen and Rothenberg, 2000). Through such environmentally focused superior supplier relationships firms can ultimately have a significant impact on economic performance as well (Hart, 1995; Hansmann and Kroger, 2001). It has been argued that the ability to successfully address environmental issues provide the organisations with new opportunities to sustain their competitive advantage (Hansmann and Kroger, 2001). Evidence also suggests that proactive initiatives could help the organisations to achieve superior benefits in the long run through improved management of environmental risks and development of capabilities for sustained environmental improvement (Zhu and Sarkis, 2004). More specifically, competitive advantage could be achieved through the decrease in environmental liability, the reduction in material waste and the identification and reduction of inefficient processes (Carter et al., 2000).

Nunes and Bennett (2007) design what they call an environmental performance matrix capturing the potential of companies to achieve a competitive advantage through balancing cost and benefit of incorporating environmental management in their strategy, as shown in figure 2.7.

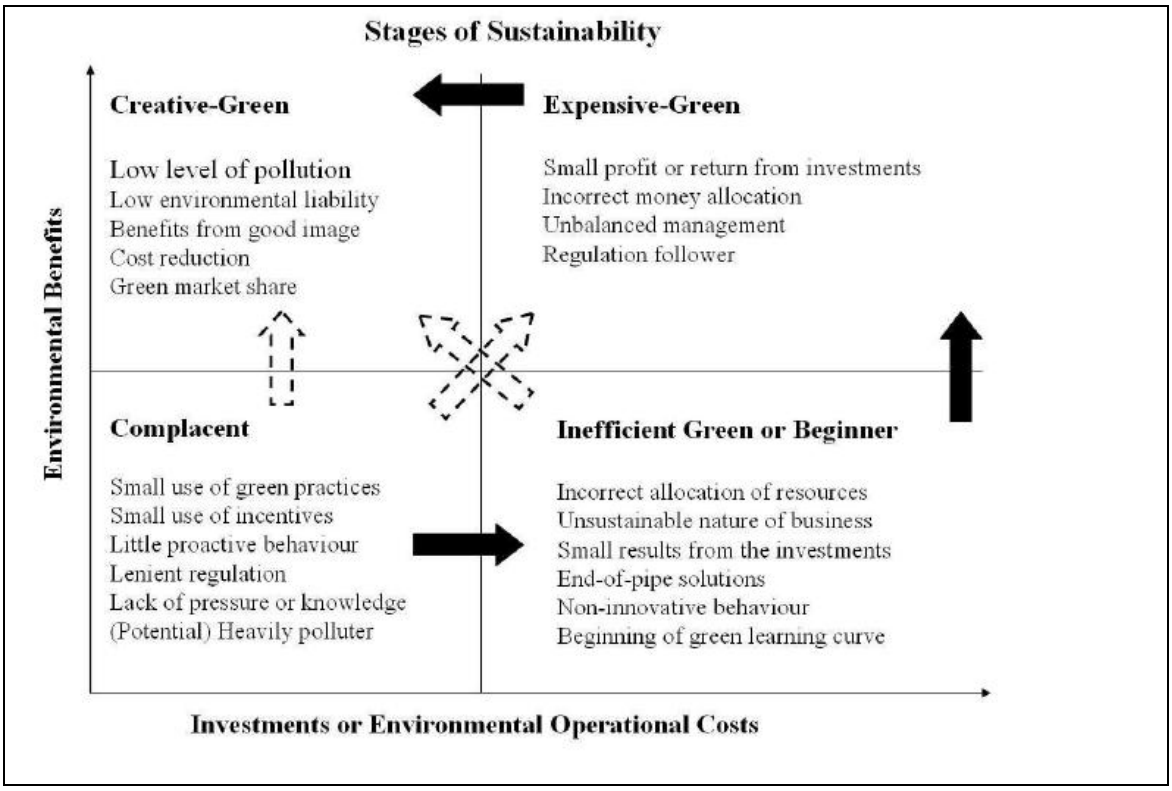


Figure 2.7: Environmental performance matrix
(Nunes and Bennet, 2007)

2.4.1 Environmental Performance

Sharma and Vredenburg (1998) define environmental performance as the environmental impact that a corporation's activity has on the natural surroundings. According to Judge and Douglas (1998) environmental performance is defined "as a firm's effectiveness in meeting and exceeding society's expectations with respect to concern for the natural environment" (p.245). While the importance of taking environmental performance into account when assessing a company's strategy and competitive stand has been increasingly recognized by researchers the question about the right way how to measure environmental performance is still an open one (Banerjee, 2002).

There are a number of examples for environmental performance measurement in the literature. In his case study of Xerox company McIntyre (1998) describes the company's early application of an environmental management system criticizing its restrictiveness as a site-specific management system. Rothenberg et al. (2005), for example, suggest the following four benchmarking categories for the automotive industry: gross emissions, efficiency, life-cycle analysis, and regulatory compliance. Veleva et al. (2001) put forward five indicators: facility compliance/conformance, facility material use and performance, facility effects, supply chain and product life-cycle and sustainable systems. Nunes and Bennett (2007) go a slightly different way by proposing a system of indicators focusing and measuring the environmental benefits resulting from a company's green activities. They distinguish between intermediate indicators, which illustrate the efforts, attitude and behavior of an organisation to enhance its environmental performance, such as 'investments in more efficient equipment' or 'number of products designed for recycling', and final indicators representing the tangible and visible results from investments and activities of operations management, such as 'energy savings in kilowatt' or 'tons of products recycled'.

There exist a number of analytical and procedural tools to support companies to measure environmental performance. 'Life cycle analysis' and 'Environmental Input and Output Analysis' are examples for analytical tools. 'Environmental performance evaluation' and 'environmental impact assessment' belong to the category of procedural tools (Papadopoulos and Giama, 2007). The tools and methods used for environmental performance evaluation could entail such systems as 'environmental management accounting', 'environmental management system', 'life-cycle analysis' and 'eco-labeling'. Supportive ISO standards include, among others, ISO 14000 and ISO 14031. Environmental performance indicators consist of 'operative performance indicators' and 'management performance indicators'. Operative performance indicators are related mainly to materials' consumption, energy management, waste and emission production, and evaluation of real environmental aspects of organisations, whereas management performance indicators mainly concern the administration's efforts, measures, and contribution to the overall organisation's environmental management (Papadopoulos and Giama, 2007). For measuring the environmental performance of supply chains in the food sector Folinas et al. (2013) propose lean thinking techniques, such as Value-

Stream Mapping (VSM). Chien and Shih (2007) include in their research framework for studying relationships between environmental regulations, external stakeholders, GSCM practices, environmental performance and financial performance in manufacturing companies in the electrical and electronic industry in Taiwan two aspects in environmental performance, as depicted in figure 2.8.

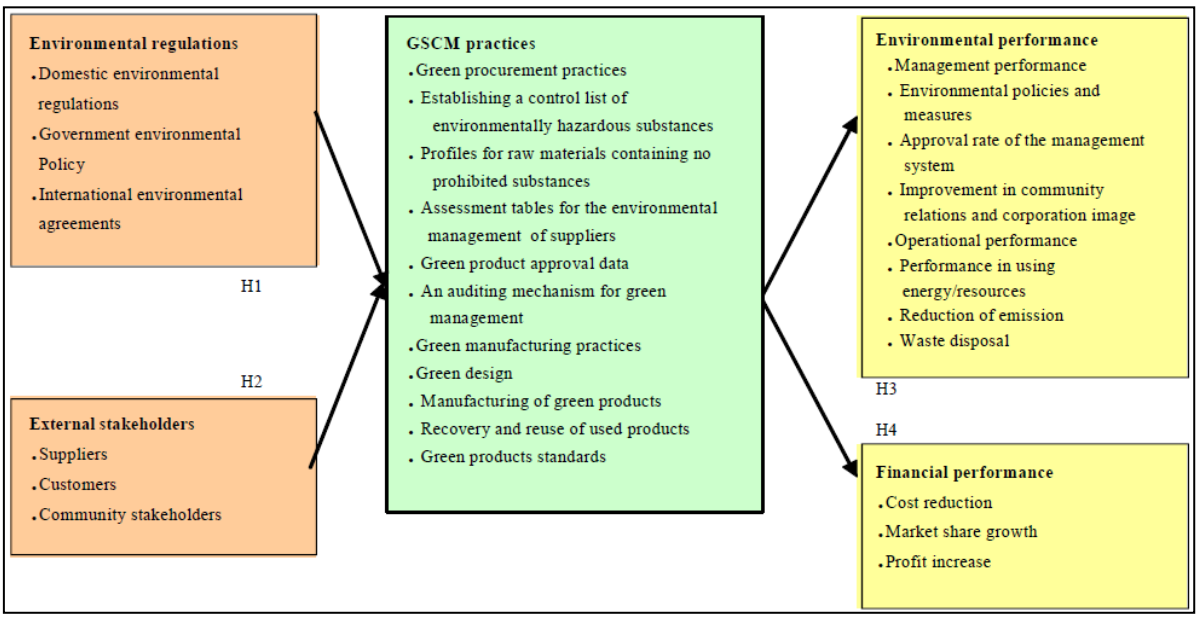


Figure 2.8: Research framework for GSCM practices
(Chien and Shih, 2007)

Management performance refers to environmental policies and measures, the approval rate of the management system, and the improvement in community relations and corporation image. Operational performance entails the performance in using energy and resources, the reduction of emission, and waste disposal. Effective management of suppliers can reduce transaction costs, promote recycling and reuse of raw materials, and the production of waste and hazardous substances can be cut (Sarkis, 2003).

Azzone and Noci (1996) suggest an integrated approach for measuring the environmental performance of new products, while Arena et al. (2003) assess the environmental performance of alternative solid waste management options that could be used. Klassen and McLaughlin's (1996) proposed model and empirical findings suggest a positive effect of environmental performance through both market and cost pathways. The literature for supporting this positive relationship is relatively strong (Zhu et al.,

2005). The implementation of an environmental management system can complement a company's green supply chain management efforts and improve corporate environmental performance (Melnyk et al. 2002; Darnall et al., 2006).

Frosch (1994) argues that an inter-firm linkage facilitated by proximity could lead to an improvement in environmental performance. Geffen and Rothenberg (2000) suggest that relations with suppliers aid the adoption and development of innovative environmental technologies, and that the interaction of customer and supplier staff, partnership agreements and joint R & D can lead to improved environmental performance.

Hanna et al. (2000) find in their research a strong relationship between meeting operational goals and staff involvement on environmental management. Sroufe (2003) creates a framework with performance indicators and supplier assessment metrics for gaining competitive advantage and reducing risk. Hervani et al. (2005) give an overview of performance measurement literature and draft an integrative framework for study, design and evaluation for GSCM tools. Kainuma and Tawara (2006) construct a multi-attribute utility function of the supply chain and refer to the impact of information sharing. Simpson et al. (2005) ascertain that customer performance requirements on suppliers have an impact on suppliers' environmental performance. Rao (2002) conducts a study on performance measurement in South East Asia commenting on the progress and difficulties of implementing GSCM in that particular region. Harvey and Schaefer (2001) discover that external reporting serves as pressure for better performance results.

2.4.2 Economic Performance

Controversial issues in the field of green supply chain management include the question if value can be created through a green supply chain (Porter and Van der Linde, 1995). Although there is little doubt that more stringent environmental standards have to be met and many organisations have to devote increasing resources to develop and implement corresponding measures, there is no clear answer to the question if a better environmental performance results also in a better economic performance (Wagner et al., 2001).

While some researchers find lower costs and positive effect on value resulting from implementation of environmental-friendly processes (Rao and Holt, 2005; Florida, 1996), other authors argue that implementing environmental practices always result in a trade-off with poorer economic performance (Walley and Whitehead, 1994). Chien and Shih (2007) define financial performance as cost reduction, market share growth and profit increase. Alvarez et al. (2001) discover a positive effect of greening the supply chain on a firm's economic performance. GSCM can cut the cost of materials purchasing and energy consumption, reduce the cost of waste treatment and discharge, and avoid a fine in the case of environmental accidents (Zhu and Sarkis, 2004). A sustainable approach can lead to internal cost saving, open new markets and find beneficial uses for waste (Tsoulfas and Pappis, 2006).

According to Fuentes-Fuentes et al. (2004), green practices have a positive effect on a company's growth in profits, sales and market share. Klassen and Mclaughlin (1996) show that organisations minimizing the negative environmental impacts of their products and processes, recycling post-consumer waste and establishing environmental management systems are very likely to expand their markets or displace competitors that fail to promote strong environmental performance. Revenues can be positively impacted when customers prefer the products of environmentally friendly firms (Winsemius and Guntram, 1992). Costs may be reduced through proactively managing environmental regulations, which may create barriers and first-mover advantages that are difficult for competitors to imitate (Dean and Brown, 1995).

Porter and Van de Linde (1995) argue that throughout a product's life cycle, pollution reflects hidden costs in the form of wasted resources and effort. By adopting GSCM practices these costs can be reduced. Orlitzky et al. (2003) show, based on a meta-analysis, that there is a positive association between corporate social performance and corporate financial performance across industries. Contrary to that, Bowen et al. (2001b) warn that economic performance cannot be expected to be seen in boosted profitability or sales performance, at least not in the short-term. In a study on Chinese enterprises Zhu et al. (2005) confirm that there is no improved economic performance through implementation of GSCM.

2.4.3 Operational Performance

Besides the aspect of economic performance also operational performance should be taken into account when looking at the effects of GSCM implementation, although until recently the relationship between the two aspects has not been subject of many researches (Zhu et al., 2007). On the one hand, following external and internal ecological statutes may increase a company's operational costs but as a positive effect it may also increase a company's product line or improve capacity utilisation (Zhu, 2008). Szwilski (2000) confirms in his study a positive impact of EMS implementation on operational performance.

2.4.4 Social Performance

The focus of measuring performance when examining implemention of GSCM often lies on environmental and economic indicators (Zhu et al., 2005). Social effects are not often taken into account in this context, whereas investigating the topic of corporate social responsibility or sustainability management usually follows to the triple bottom line approach and entails also the social dimension. Social aspects could entail such issues as health and safety at the workplace, labour standards and worker rights, business integrity and transparency of business operations, gender and racial equity.

As explained earlier, within the scope of the present research social company performance will not be approached in its full dimension but rather with the focus on the resulting effects of the implementation of green supply chain management practices in a company (Baresel-Bofinger et al., 2011b).

The focus of measuring performance when examining implementation of GSCM often lies on environmental and economic indicators (Zhu et al., 2005). Social effects are not often taken into account within this context, as Touboulic and Walker (2015) show in their literature analysis. Generally, social aspects can relate to a company's human resource activity, community activity and product activity and entail such issues as health and safety at the workplace, labour standards and worker rights, gender and racial equity in regard to the human first dimension, support and charity programmes, participation in educational and occupational programmes, governance issues, business integrity and transparency of business operations in regard to the second dimension, and

issues such as product safety and customer choice possibility in regard to the third dimension (Carroll and Shabana, 2010; Wood, 2010; Chen and Delmas, 2011).

Within the scope of the present research social company performance will not be approached in its full dimension but rather with the narrowed focus on the effects that the implementation of green supply chain management practices can have on the social activities of a company. In that sense, social issues such as racial and gender equality may not be considered if they do not prove to have a direct connection to GSCM practices. On the other hand, social aspects, such as employee safety and health and the company's participation in educational programmes for the community may probably be directly affected by GSCM practices.

In this context the indicators of social impacts of GSCM practices may not be entirely the same as social indicators usually related to corporate social responsibility. It is, for example, not primarily evident how GSCM practices might affect work force diversity or gender equality in a company. Other issues, such as for example company practices of disclosure of information besides financial accounting can be addressed with requests for environmental reporting. Likewise, environmental measure indicators for implementation of GSCM practices in the production line, such as for example decrease of toxic raw material, can be linked to a corresponding social measures, such as for example protection of health and safety of employees in the production process.

Thus the approach of this research primarily addresses the environmental aspect of sustainability, namely ecological sustainability. On a second level when looking at the effects that the implementation of green supply chain management practices have on a company's performance, besides the ecological aspects also the economic and social dimensions are examined as well as the effects on operational performance and intellectual capital as part of potential value creation for the company.

2.5 Situation in Greece

Supply chains have become complex networks of multi-layered activities and a multitude of players around the globe to an extent that responsibility for environmental concerns may be attributed to any member of the chain. Greece, an EU member since

1981, is under direct influence of the growing EU environmental legislation that affects virtually all products at all levels of the supply chain. Greece's low ranking in the 2008 Environmental Performance Index shows the need to examine closer the given conditions for an effective implementation of GSCM practices. Table 2.1 depicts an excerpt of research related to the adoption of green management practices in Greece.

2.5.1 Environmental Business Policies in Greece

Supply chains have become complex networks of multi-layered activities and a multitude of players around the globe to an extent that responsibility for environmental concerns may be attributed to any member of the chain. The region of South East Europe, in spite of its good geographical position, faces severe hindrances to become a competitive player in the global supply chain networks (Ketikidis et al., 2008). Greece, an EU member since 1981, is under direct influence of the growing EU environmental legislation that affects virtually all products at all levels of the supply chain. Greece is usually seen as a latecomer on the environmental scene, where compliance with environmental regulations is rather on a voluntary and incentive-based level than on a mandatory one (Kassolis, 2007).

A country's social and institutional capacity for environmental sustainability refers to the extent that a country has in place institutions and underlying social patterns of skills, attitudes, networks that foster effective responses to environmental challenges (Husted, 2005). Besides a nation's capacities for scientific research, production of environmental information, debate, environmental regulation and enforcement it also includes the private sector's responsiveness to environmental problems. Katz et al. (2001) conclude that the will and ability to protect the environment are influenced by intra-country socio-cultural factors. If people are more culturally conscious of environmental conditions, a higher level of environmental sustainability can be maintained. National culture is expected to influence how people utilise their natural resources and environments by shaping their attitudes and perceptions (Hoon et al., 2007). Psychogios and Priporas (2007) report that all of the Greek managers interviewed by them see the need to modernise the Greek economy, in general, and the management system, in particular, in order to match the demands of EU membership as well as the pressure from increased international market competition. In a study about

the implementation of EMSs in the Greek industry, Georgiadou and Tsiotras (1998) found out that the Greek companies consider the implementation of environmental management standards, such as ISO 14001, the most important factors in improving an organisation's image, reducing production cost and improving quality, and showing care for the environment, whereas factors, such as facilitating management of environmental aspects and satisfying customer environmental expectations, are considered less important. The major research contributions to this field are summarized in table 2.1.

Table 2.1: Key research related to adopting green management practices in Greece

Thematic Topic	**Issue**	**Reference**
Aspects of green supply chain	Green packaging	Mandaraka and Kormentza, 2000
	Reverse logistics	Giannoula and Michopoulos, 2001
	EMS	Abeliotis, 2006
	ISO	Giannakourou,2001
	Implementation of EMS adopting ISO 14001	Georgiadou and George Tsiotras, 1998
Industries	Mining industry	Evangelinos and Oku, 2006
	Cement and concrete production industry	Koroneos and Dompros, 2009
	Food industry	Bourlakis and Bourlakis, 2001
Environmental policy in Greece	Implementation of EU directives, role of social actors	Daut, 2009
	Reasons for non-compliance with EU environmental law	Borzel, 2000
	Reasons for non-compliance with EU environmental law	Koutalakis, 2004
	Environmental governance in EU member states	Weale et al., 2000
	Effects of ISO 14001	Kassolis, 2007
	Institutional and cultural factors for implementation of EU environemntal policies	Pridham, 2002
Managerial culture	Eiffel Tower organizational culture, Greek societal values	Joiner, 2000
	Organisational culture, management commitment	Bourantas and Papalexandris, 1992
	Organisational culture based on Handy's conceptual framework	Bourantas et al., 1990
	Managers' attitude to TQM	Psychogios and Priporas, 2007
Performance measures	CSR reports	Panayiotou, A., Aravossis, K.G. and Moschou, P., 2009

According to research from the Grant Thornton International Business Report (IBR, 2009), Greece is characterised as one of the economies with low perceptions of environmental friendliness within the business community. Watson and Emery (2004) characterise environmental policy in Greece as incapable of making a difference in organisations' economic and social behaviour. This may be exemplified by the implementation of EMSs and ISO 14001 certifications in Greece (Abeliotis, 2006). For December 2006, Greece shows for EMAS sites a total number of 54 and for ISO 14001 a number of 300, based on the data from the German Federal Environment Agency (2007), demonstrating a rather weak position of 43 in international ranking of 146 countries.

A look into the past shows a poor transposition rate of EU environmental policy directives in Greece. In the years 1990-1995 the average transposition rate for Greece was 84% compared to 92% in Germany and 94% in France, while infringement proceedings for Greece were very high (Borzel, 2000). But also more recently, business policy in Greece does not give a much improved picture.

On the occasion of the World Economic Forum in Davos in February 2009, the 2008 Environmental Performance Index (EPI) was published. This index, developed by the US universities of Yale and Columbia, is a benchmark index of the environmental performance of a country's policies. The EPI ranks Greece on place 44 of 149 in international comparison and on place 20 on European Union level, as shown in Table 2.2. Companies are often criticized for the damaging effects of their operations on the

Table 2.2: Country ranking according to environmental policies' performance (Environmental Performance Index 2008)

Rank	Country	EPI	Rank	Country	EPI	Rank	Country	EPI
1	Sweden	93.1	10	Slovakia	86.0	19	Poland	80.5
2	Finland	91.4	11	Portugal	85.8	20	Greece	80.2
3	Austria	89.4	12	Estonia	85.2	21	Cyprus	79.2
4	Latvia	88.8	13	Italy	84.2	22	Netherlands	78.7
5	France	87.8	14	Hungary	84.2	23	Bulgaria	78.5
6	Germany	86.3	15	Denmark	84.0	24	Belgium	78.4
7	United Kingdom	86.3	16	Spain	83.1	25	Czech Rep.	76.8
8	Slovenia	86.3	17	Luxembourg	83.1	26	Romania	71.9
9	Lithuania	86.2	18	Ireland	82.7			

natural environment and the local community. The ranking of Greece should serve as an incentive to look again further into the ways how environmental practices are implemented along the supply chain.

Greece's economy is characterized by a large number of small and medium-size enterprises. There is a large concentration of 45% of all industrial units in the Attica Region which intensifies pollution of the environment there (National Reporting to UNCSD, 2004). There is a steady increase of air pollutants following GDP growth. Solid waste quantities are rising (Eionet, 2009) but there is progress in management of hazardous wastes with the help of national and EU funding (National Reporting to UNCSD, 2006). A decrease in environmental pressures from industrial sector can be seen due to lower manufacturing expansion and institutional changes (NSSD, 2002). EU directives are transposed into national laws and strategies but problems with implementation exist (Pridham, 2002). National initiatives entail, among others, the National Strategy for Sustainable Development, which initiates a shift to proactive-preventive measures, the Operational Programme "Competitiveness" supported by the Community Support Framework, and the Operational "Environment" Programme.

Greece is usually seen as a latecomer on the environmental scene, where compliance with environmental regulations is rather on a voluntary and incentive- based level than on a mandatory one. Full membership of the EU in 1981 and the EU's efforts in the early 1990s to harmonise environmental policies between member states within the emerging framework of sustainable development helped push the environmental agenda (Weale et al., 2000). The EU maintains a permanent pressure on Greece in relation to environmental issues, and in quite a number of cases Greece has been severely fined for non-compliance with EU environment directives. EU member states and their neighbours are making an increasing effort to comply with environmental regulations as they perceive environmental threats more and more a pressure to economic success (Weale et al., 2000). The Greek government has made an effort to adopt sustainable development although it had traditionally viewed environmental protection a topic of lesser importance. Environmental issues are discussed at Ministry level, such as the Ministry of Public Works and Environment, but also through committees at inter-ministry level.

Greece has increasingly encouraged the application of voluntary action in its environmental policies, and the interaction between legislative change and business practice is a slowly growing feature in the country (Kassolis, 2007). The implementation of the Eco-Management and Audit Scheme regulation and the ISO 14001 standard has been integrated easily into the national framework of environmental management policies. Although this has been a positive change for environmental management practices in Greece, ISO14001 has not gained much in terms of its environmental dimension in the country, because awareness, interest and knowledge in environmental management remain rather low.

In the past, the capacity of Greek governments has been almost exclusively judged on the grounds of how quickly they absorb Community funds apparently for economic growth. Integration of environmental considerations into industrial policies has been considered desirable mostly to the extent that it does not slow these absorption rates (Pridham, 2002). There exist strategic, structural and procedural impediments to implement environmental management practices. Partly due to the lack of conceptual perception of environmental management practices and sustainable development there is a general lack in specific content as to how environmental management practices are to be attained or who is responsible for achieving them (Kassolis, 2007). There is also a lack of organized efforts to inform the public on such issues. Although stricter procedures in particular stages of environmental management have been enacted, practices are generally lagging behind and are vague. Kassolis (2007) claims that significant actions, policies and tools are missing in Greece due to low priority setting and lack of political will, as well as due to the fact that the institutional context together with the necessary chain of regulatory framework has not been clearly defined.

There are still relatively few examples of successful implementations of GSCM in Greece. It seems very important to build the necessary technical and managerial capacity of organisations to address environmental problems. Transferring advanced environmental technologies and know-how from other countries, more advanced in ecological approaches, could be helpful to facilitate the implementation of innovative methods of GSCM. Dissemination of best practices of cost effective, replicable and locally feasible environmental management approaches would support the process.

2.5.2 Environmental Management

When looking at the record of striving for ecological sustainability Greece falls behind in European and international comparison (Borzel, 2000). The reason might be looked for in the particular political, societal and cultural circumstances in the country. One the one hand Greece is characterized by a centralised complex regulatory system (Getimis and Giannakourou, 2001). At the same time this system shows a high degree of ineffectiveness (Giannakourou, 2001).

Greece together with other South European EU member states has a reputation of having a rather lax attitude toward implementation of EU environmental policies. Borzel (2000) argues that reason for that may be found in the little power of environmental groups are the general lack of environmental awareness in the population. This disability of civil society to take stronger interest and action in matters of environmental protection is also observed by Koutalakis (2004).

Evans (2007) argues that there is no rigid firm boundary and that a company's values and activities are strongly influenced by the cultural context by which the enterprise is surrounded. Strategic choices of managers are affected by profiles of national culture (Franke et al., 1991). National culture also affects the success of technology transfer (Kedia and Bhagat, 1988). Thus it is necessary to understand how culture affects issues related to environmental sustainability in different countries.

In addition, the public policy choices of a country are significantly influenced by culture (Vogel 1987). The willingness of a people and their politicians to pursue appropriate environmental policy often depends on the idiosyncratic cultural values of the country. The implementation of policy is also affected by culture. Political and other leaders need to grasp the role of national culture and its impact on sustainability in order to develop and implement effective public policy. A country's social and institutional capacity for environmental sustainability refers to the extent that a country has in place institutions and underlying social patterns of skills, attitudes, networks that foster effective responses to environmental challenges (Husted, 2005). Besides a nation's capacities for scientific research, production of environmental information, debate,

environmental regulation and enforcement it also includes the private sector's responsiveness to environmental problems. Katz et al. (2001) conclude that the will and ability to protect the environment are influenced by intra-country socio-cultural factors. If people are more culturally conscious of environmental conditions, a higher level of environmental sustainability can be maintained. National culture is expected to influence how people utilize their natural resources and environments by shaping their attitudes and perceptions (Hoon et al., 2007).

A number of studies have discussed the relation between national culture and environmental conditions. Cohen and Nelson (1994) propose that the mechanism of a link between culture and the environment must be the impact of culture on normative ethical beliefs regarding what is morally correct behavior. These beliefs are reflected in common business practices, government regulation of business activity, and are widely held perceptions of acceptable business conduct within a given society. This suggests that the perception of environmentally responsible behaviour can be significantly different across countries. In a similar way, Gorham (1997) argued that cultural factors operate at various levels: through the policies of sovereign states, public and private agencies that serve the policies, and the public officials who are directly responsible for how the policies are carried out.

The impact of country specific conditions on company performance has been long acknowledged in business research (Caves, 1982), regarding for example the choice of entry mode or the determinants of foreign direct investments. But, as Christmann et al. (1999) point out, those studies were mostly interested in the question for what reason and in which way firms choose a country for setting up production rather than looking into the conditions that influence their performance once they are operating in a country.

Joiner (2001), using Trompenaar's (1993) four dimension organisational culture typology, argues that Greece would most likely be categorized as a role-oriented culture ('Eiffel Tower') , which is characterized as a culture with a strong emphasis on centralization and high formalization. Roles and tasks within the organisation are clearly defined and coordinated from the top. Authority is derived from a person's position or role within the organisation rather than the person per se. An empirical study

of a large number of Greek managers by Bourantas and Papalexandris (1992) also came to the result that Greek enterprises can be characterized by centralization of decision-making authority. Hofstede's (1980) model of national culture classifies Greece as a type of high-power distance, strong uncertainty avoidance, collectivistic and masculine. As Bourantas et al. (1990) observe, most private enterprises in Greece are family businesses and their top management is made of members of their family who generally dominate whatever professional management there is.

2.6 Conclusion and Summary

Green supply chain management has grown into a research field that attracts a lot of interest according to the two facts that supply chain management has developed into a business function of strategic importance and the need of companies to respond to the challenges of environmental pressures. Still, there is a lot more research necessary on disputed topics such as performance measurement. This subsection has shown various aspects of GSCM research. It has given account of the drivers and barriers for successful implementation. It has discussed the role of GSCM in a firm's overall strategy, emphasizing the strategic importance of green purchasing, in particular in manufacturing, as well as the necessity to pay attention to inter-firm collaboration. The relationship between environmental responsibility and company performance was laid out with the demonstration of the ongoing debate in research if environmental and economic performance are to be seen as a trade-off or if the two aspects can be reconciled or even reinforce each other. Also aspects of operational performance were referred to. It was clarified that the research addresses the dimension of social performance as far as it is related to the effects of the implementation of green supply chain management practices.

CHAPTER 3: RESEARCH PROCESS

3.1 Introduction

In this section the research methodology and methods that were used to collect and analyse the empirical data are presented and discussed. First, the chosen research approach is laid out. Then the rational for the choice of qualitative research is explained. Subsequently, the research design is discussed, in particular the case study design. This research is mainly exploratory in its attempt to investigate the circumstances under which GSCM practices are currently implemented in manufacturing companies in Greece and how they impact company performance.

The chosen approach is an inductive one. Its focus is on gathering data through in-depth case studies in order to define the determinants and success factors for efficient implementation of GSCM measures and their positive effect on company performance.

Figure 3.1 depicts the logical coherence of the various methodological steps. Table 1.1 in chapter one showed the research objectives and the intended contribution to theory and practice. The fit of the used interview guide with the research objectives can be found in Appendix E.

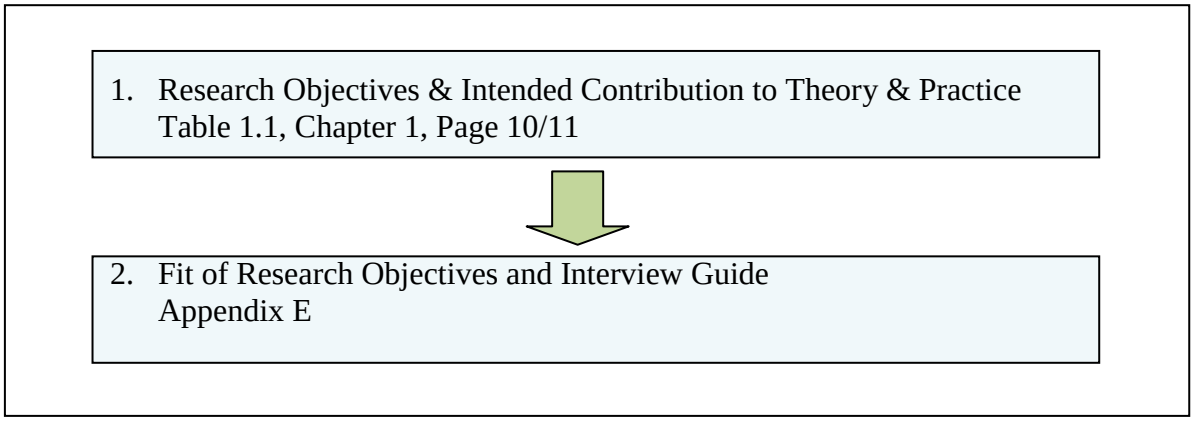


Figure 3.1 Methodological steps

3.2 Research Philosophy

To develop research in the management field one has to choose between different philosophical assumptions and methodological approaches. First, some aspects of epistemology and ontology will be discussed. Epistemology is related to the type of knowledge accepted in an area of study (Saunders et al., 2015).

In relation to the social sciences, one of the important aspects of epistemology refers to the decision whether or not the natural sciences' approach should be used for the creation of knowledge. The natural sciences' main epistemological assumption is the 'positivism' which presupposes that the researcher will use an existing theory to develop hypotheses. Tests are conducted based on these hypotheses. The results can lead to partial or complete confirmation, or refutation of the hypotheses (Johnson and Duberley, 2000). Another important aspect of the positivist epistemology is that the research should be conducted in a value-free way, that is, without the involvement of the researcher's feelings.

Indeed, the main idea of positivism is that the social world is an external concept, and it should be analysed objectively instead of subjectively "through sensation, reflection or intuition" (Easterby-Smith et al., 2002, p. 28). It should also be remembered that although other epistemological assumptions have been used in management research, positivism has dominated and continues to dominate (Johnson et al., 2006).

For Saunders et al. (2015), there are other two important epistemological stances in management research: 'realism' and 'interpretivism'. In contrast to 'positivism', 'realism' is focused on sensation. The truth is based on what is shown by the senses as reality and there is a belief that objects exist independently of human cognition (Saunders et al., 2015). Realism can be divided into 'direct realism' and 'critical realism'. The differences between them refer to the way the world is experienced. While for direct realists, the existence of the thing itself and the sensations transmitted by it are enough, for critical realists, this is just a first step in experiencing the world. The second step refers to how mind retains the experience a while after the sensation is experienced (Saunders et al., 2015).

‘Interpretivism’ presupposes that differences in humans’ role as social actors should be taken into account. As a consequence, humans should not be studied in the same way as objects (Bryman, 2016). Indeed, it can be said that ‘interpretivism’ comes from two intellectual traditions: ‘phenomenology’ and ‘symbolic interactionism’. The former is related to how humans make sense of the world around them, and the latter refers to the fact that people’s meanings and actions are continuously adjusted as a result of their interpretations of the interactions with others (Saunders et al., 2015). In fact, the challenge for the interpretivist researcher is to enter the social world of the research subjects and to focus on understanding their world from their perspective.

Ontology is about the nature of reality (Bryman, 2016). It can be said that much of the philosophical debate arises from the discussion of ontological assumptions (Easterby-Smith et al., 2002). Two ontological perspectives are objectivism and subjectivism. Saunders et al. (2015) explain that objectivism portrays that social entities exist in reality external to social actors, whereas subjectivism presupposes that social phenomena are created from the perceptions and consequent actions of social actors. This subjectivist ontology associated with an interpretivist epistemology gives rise to what has been called ‘social constructionism’. Social constructionism postulates that the researcher should explore the subjective meanings that are behind the actions of social actors in order to understand these actions. As reality is seen in this view as a social construct, social interactions between people should be understood on the base of their varying interpretation of different situations (Easterby-Smith et al., 2002). A way to analyse epistemological and ontological assumptions that has been used in the management research literature is the distinction of four paradigms made by Burrell and Morgan (1979), namely functionalist, interpretive, radical humanist and radical structuralist.

On an epistemological level this research is undertaken with an interpretive approach, based on the belief that the world can be best understood through an examination of its interpretation by its participants. The ontological assumptions underlying this research are based on the belief that reality is a socially constructed phenomenon. There is not one unitary reality but a multitude of realities depending on each individual’s own experiences (Saunders et al., 2015). So any knowledge that is

achieved through this research has to be interpreted as observation subject to the viewpoint of multiple interpretive communities.

3.3 Rationale for Adopting Qualitative Research

The selection of an appropriate research methodology for this research is, to a large extent, determined by the fact that it touches relatively novel ground. Environmental topics have found their way into the area of business. But many issues and factors in the specific topic of green supply chain management, with its double-faced character of environmental study and supply chain management approach, are still not known to their full extent. Therefore, this research applies a qualitative research approach making an attempt to understand the issues at hand within their individual context. Existing literature gives some insight in the conditions of GSCM applications in transient economies with an emerging environmental consciousness, such as South-East Asia and China but sources about the state of GSCM implementation in Greece are scarce and fragmented. Therefore, the best approach for this research appears to be exploratory. Case studies seem to be the most suitable method to apply. The answers found through the case studies were compared with the findings from the literature review.

A qualitative approach seems appropriate for this study as it intends to understand how the processes of GSCM practices are implemented, experienced, and interpreted by social actors within the complex social environment of an enterprise. Although there is more than one definition of qualitative research, the common view holds that its focus is on studying processes and social realities (Hopper and Powell, 1985). This thesis is based upon a qualitative research design due to the main aim of this investigation being to explain how implementation of GSCM practices is done in Greek manufacturing companies by obtaining a holistic, systematic, and integrated understanding of the related drivers and barriers as well as the consequences and potential for improvement. The qualitative approach is chosen because this research aims to study in-depth issues, such as power relations within the company and the environmental pressures, which play important roles in the adoption of GSCM practices. The qualitative approach can include interviews, questionnaires, direct observation, content analysis of documents and archival research (Voss et al., 2002).

3.3 Research Method

The choice of the research method for this study follows the decision of adopting the qualitative research approach. The most suitable way of conducting this research seems to be adopting the inductive approach. The inductive approach aims to understand the way in which the social world is interpreted by people (Saunders et al., 2015), Thus, examining the context in which events happen is of major concern of an inductive research strategy (Gill and Johnson, 2002). Although many studies in this area follow a deductive approach this research chooses to be inductive as the particular research interest lies in exploring the particular Greek context that influences the adoption process of GSCM. Rather than attempting to use an existing theoretical framework and trying to interpret the situation in the region through a pre-existing view, this research through the analysis of the data collected through multiple case studies defines the determinants of effective GSCM implementation with special reference to the particularities of the regional context, which then will be compared to the existing literature. Similarities and discrepancies to other theoretical frameworks and empirical researches are discovered and interpreted, and thus new aspects in regard to the possibilities to effectively implement GSCM are shown in a so far in this respect under-researched region of the world.

The outcomes of an inductive approach, based on systematic empirical research, may also be considered of more practical value to practising managers (Tenbrunsel et al., 1996; Partington, 2000). Saunders et al. (2015) list the options for an inductive research strategy as case study, action research, grounded theory, and ethnography. Creswell (2013) identifies five approaches of qualitative research: narrative research, phenomenology, grounded theory, ethnography and case studies. Whereas narrative study has as subject the life of one individual, phenomenology deals with the experience of a number of individuals. (Creswell, 2013) In contrary to these two types of descriptive research, grounded theory (Glaser and Strauss, 1967) has the objective to generate theory based on the experience of participants in the process under observation (Strauss and Corbin, 1998). According to Saunders et al. (2015) grounded theory should be considered a combination of induction and deduction. The main idea is to generate theory by developing predictions from data observation which in turn are to be tested

again in further observations (Creswell, 2013). Ethnographic research is concerned with studying an entire group sharing the same culture (Bryman, 2016). Action research is a research strategy which is interpreted in various ways. One of its major characteristics is the focus on intervention in a situation rather than just describing and evaluating it (Cassell and Johnson, 2006). In action research practitioners and researchers are supposed to work together closely (Saunders et al., 2015). The case study is a research approach "that involves empirical investigation of a particular contemporary phenomenon within its real-life context, using multiple sources of evidence" (Saunders et al., 2015, p. 585). Case study can involve one single case or multiple cases and uses detailed data collection from multiple sources of information (Bryman, 2016).

Among these types the multiple case study method was considered appropriate for this study. The multiple case study method allows this research to explore, understand and explain the wide variety of factors related to the implementation of GSCM practices and its consequences. The selection of the appropriate research methodology for this study is determined by the fact that until recently the combination of environmental practices in the supply chain area has been relative new ground for research. The relative novelty of the research question means that the issues and factors involved are not yet known to their full extent. This study is hence mostly exploratory. But there is also an explanatory aspect to it in so far as the causal relationship between the various factors influencing the adoption of GSCM practices and their effect on organisational performance is concerned. The case study emerges as the most suitable research method. The case study is preferred when 'how' and 'why' questions are the focus of research, when the researcher has little control over events or circumstances of the phenomena in question, and when the investigation has some real life context (Yin, 2009). Creswell (2013) distinguishes between a single instrumental case study and a multiple case study. In the latter approach the same issue is illustrated through a number of different cases, giving to the researcher also the possibility to refer to different perspectives on the issue in focus. Yin (2009) emphasizes his preference to the multiple case studies approach for reasons of better validity and reliability of the findings.

According to Yin (2009) the quality of case study research is judged by four criteria. The first criterion is construct validity. Construct validity refers to the demand that the researcher needs to apply the operational measures that are appropriate for the

subject to be studied. Yin (2009) insists that if this requirement is neglected the quality and objectivity of data are compromised, as in particular case study research is often criticised for. As a tool to help achieve construct validity, Yin (2009) recommends "the use of multiple sources of evidence, to establish chains of evidence and to let key informants review the draft study" (p. 58).

In the present research the main sources of information are the interviews with the various managers and directors as listed in Appendix F. These data sources were complemented by other sources of evidence wherever possible. Such alternative sources were in-house and external documentation and reports as well as direct observations at the companies' facilities and spontaneous contact with staff on the premises. The complementary sources of interviewing 1st and 2nd tier suppliers, as for example suggested by Preuss (2005), were only available in a very restricted manner for this research.

A second criterion formulated by Yin (2009) is 'internal validity'. Internal validity refers to the causality established by the researchers between the investigated data. Yin (2009) warns that:

> "Because of the complexity of the material in exploratory studies, internal validity can be threatened by spurious links or by interferences the researcher makes where a direct link is not clearly observable." (p. 65)

The third criterion mentioned by Yin (2009) is 'external validity' that refers to the generalisation of the research finding. As Saunders et al. (2015) argue, case study results, in general, cannot be easily generalised for a wider domain. However, this conclusion can be put into perspective making the argument that while not having the advantage of statistical evidence as a large survey, "the findings of a single or multiple case study can be generalised into a broader theory, and this theory is then applicable to a further number of similar cases" (Preuss, 2005, p. 149).

The last criterion postulated by Yin (2009) is 'reliability' and aims to minimise the sources of bias and error. Thus, it shall be ensured "that the procedures of the study, particularly the data collection, can be repeated by other researchers and lead to

comparable results" (Yin, 2009, p. 102). In order to increase reliability in the present research, a case study protocol has been used for each visit at the investigated companies (Appendix C) and an interview guide was given to each interviewee (Appendix D).

Taking into consideration all the criteria mentioned above, this research applies an in-depth multiple case study approach of five selected enterprises. The in-depth case studies allow the collection of rich empirical data from a variety of complementing sources. Nevertheless the multiple case studies approach is not intended to be a macroscopic study and aims for only limited generalisation, as discussed above (Yin, 2009).

3.4 Research Questions

The objective of this research is to examine the existing practices of green supply chain management in manufacturing companies in Greece and how green management practices can be efficiently implemented along their supply chain in order to achieve a better company performance. Company performance in this framework entails environmental, operational, economic and social aspects.

In the pursuit of the objective stated above this research explores the various factors affecting GSCM implementation in those companies, as depicted in figure 3.2. The main drivers and barriers are looked at. The interaction of intra-organisational and extra-organisational factors which shape the integration of environmental consciousness in the management processes of the supply chain are examined. Industry behaviour and organisational culture in relation to adoption of GSCM practices are scrutinised. The degree of awareness amongst manufacturing companies of the opportunities available to them for developing their business strategy for adoption of green practices in the supply chain is looked at. This inquiry analyses how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece. Finally, this research makes the attempt to demonstrate how fundamental the successful implementation of green management practices along the supply chain is for future industry performance in the country in focus.

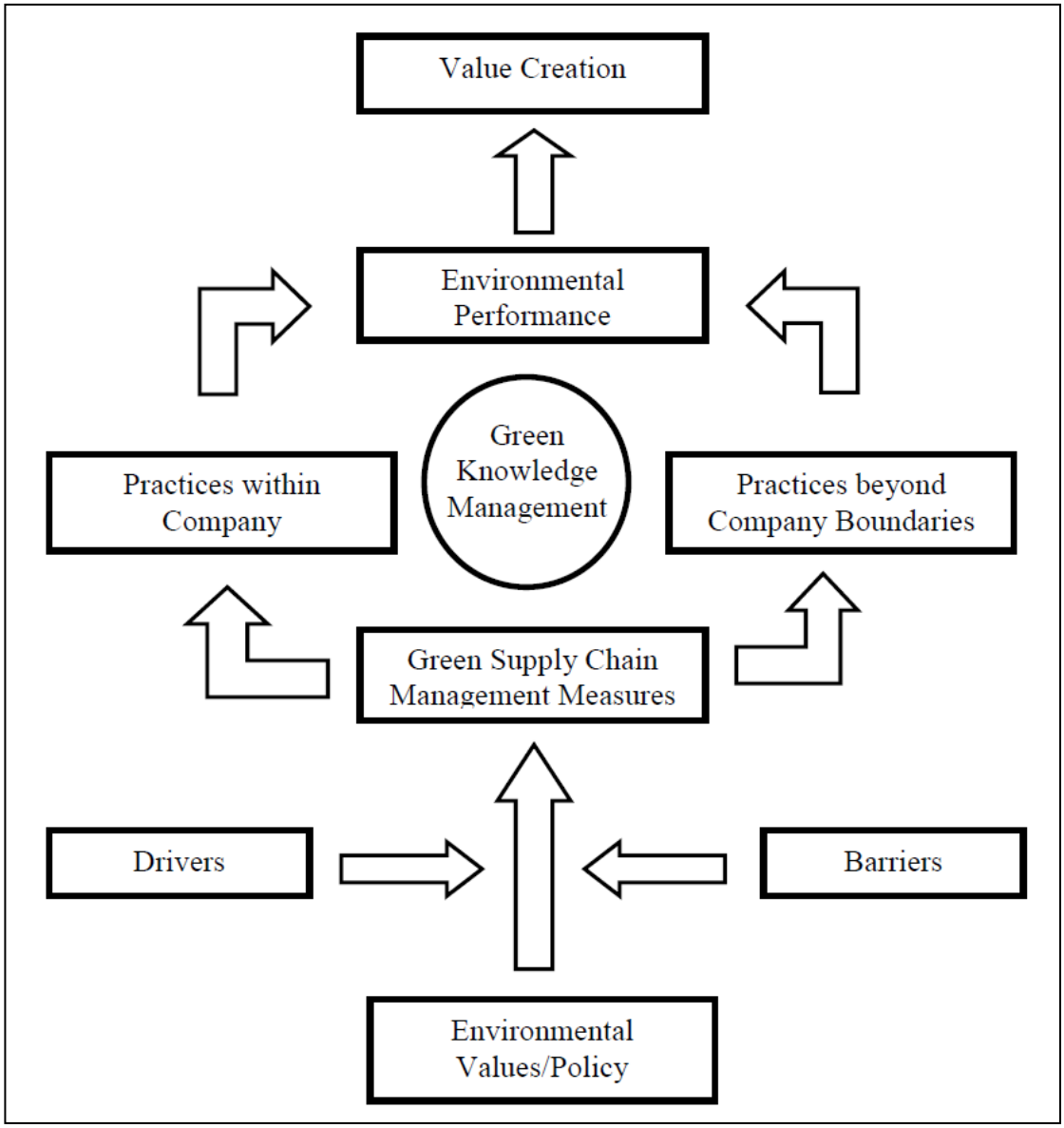


Figure 3.2: Research key themes

Thus, the main objectives of the study can be described as follows:

1. Evaluate basic concepts of greening strategies for companies' supply chains
2. Determine through thorough examination of literature controversial issues and gaps in existing research
3. Examine on a firm and inter-firm level opportunities and obstacles regarding the implementation of GSCM in Greece

4. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece
5. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimise the effects of impeding factors and to enhance the enabling factors
6. Propose a framework for efficient implementation of GSCM practices that is suitable for companies in an economy characterized by an emerging environmental sensitivity

The research questions are designed to identify the process of implementation of GSCM practices in manufacturing companies in Greece and to identify better ways of implementation with the goal of better environmental, operational, social and economic performance. Therefore, the main research questions of the present investigation are:

1. How can the implementation of GSCM practices in Greek manufacturing companies be improved?
2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?
3. Why are GSCM practices fundamental in future industry performance in Greece?

3.5 Data Types and Collection

There are various types of data and collection methods available for conducting research. The ones chosen for this research are explained here in further detail.

3.5.1 Data Types

Quantitative data are basically statistical data, numeric data, counts, whereas qualitative data are those non-numeric and non-quantified. While quantitative data can come from all different kinds of research strategies qualitative data are expected to be retrieved from surveys applying interviews and questionnaires (Saunders et al., 2015).

For the present research applying an exploratory multiple case-study approach with an inductive scope qualitative data seem appropriate (Saunders et al, 2015).

3.5.2 Primary Data Collection Design and Tools

For the collection of the primary data the appropriate sample and collection tool, such as interviews, need to be selected

3.5.2.1 Sample Selection

Mixed purposeful sampling was selected for this research (Patton, 1990). Case selection was driven by the need to ensure a certain degree of variety of cases but still sharing some common criterion. Companies should be from different fields of the manufacturing sector and represent different company sizes but their supply chain should extend into the region of South East Europe. Identification of product classes was undertaken, and following these selection criteria, actual companies were selected from the Greek Financial Directory of ICAP Group, comprising 20,000 companies of all domains of the Greek economy, and from chamber of commerce lists. Nevertheless, the case selection process involved also a certain degree of 'planned opportunism', as Pettigrew (1990) calls it referring to the practicalities of overcoming the limitations and difficulties of gaining access to research sites. Companies comprise small and medium-sized companies with between 150 and 850 employees, some with international presence.

The manufacturing industry has been chosen for its distinctive position in the context of environmental sustainable development. Supply chain management plays an eminent strategic role in that industry sector (Preuss, 2005).

3.5.2.2 Interviews as Data

The main research technique that was applied in this study is the interview. There are several advantages in using this technique, as Brewerton and Millward (2001) discuss. As there is a direct immediate contact between interviewer and interviewee any potential misunderstanding can be clarified on the spot and issues that may seem vague

can be discussed to a further extent. Through the direct personal contact the interviewer has the possibility to create a supportive atmosphere that helps the interviewee to feel comfortable to answer fully to the posed questions and add personal impressions. Arguably, the results of direct interviews are of better quality than those of written surveys.

Nevertheless there are also certain disadvantages in the interview technique stemming from the personal presence of the interviewer. One major disadvantage is the so-called 'interviewer effect' that may distort the respondents' answers. Brewerton and Millward (2001) describe that risk as follows:

> "Interviewer bias may result from the interviewer's own expectations, the respondent's reaction to demographic or other characteristics of the interviewer, or from the fact that respondents may see the interview as threat to personal interests and beliefs." (p. 76)

Four types of interviews are identified by May (2001): (a) structured interviews which involve asking participants a set of predetermined questions and responses. This kind of interview is typically associated with survey research (Bryman, 2016); (b) semi-structured interviewing is a technique that can be used as a guide allowing the interviewer to probe the interviewee and provide stories about how and why particular meanings attached to the phenomenon. Semi-structured interviews are more adequate when the intended purpose of the research is to understand the meanings that interviewees link to issues and situations, in addition, this type of interview provides sufficient flexibility for a researcher to build up a richer understanding of the complexities of the research setting (Saunders et al., 2015); (c) unstructured interviews consist in an informal discussion that has no strict guidelines, allowing the discussion to be open and not necessarily concise in its nature. Normally, unstructured interviews are more relevant in the initial stages of the investigation as they provide a general understanding of the problem (Creswell, 2013); and (d) the group interviews which allow researchers to focus on group norms and dynamics around issues which they aim to investigate (Saunders et al., 2015).

For the purpose of this study semi-structured, one-to-one interviews constitute the primary method of data collection. Qualitative interviews reduce the distance between interviewer and interviewee (Johns & Lee-Ross, 1998). As Saunders et al. (2015) point out, this method provides more qualitative information, more depth, more representation, more efficiency, and more value. In addition, this type of interviewing reflects the exploratory nature of the study by exploring a wide variety of aspects of GSCM as well as giving explanations why things happen. Each interviewee had the opportunity to express his/her opinion in any way he/she wished. Thus, the discussion provided a better understanding of the interviewee's' attitudes towards several issues.

The utilisation of this interview method was essential to gain insights into the participants' perceptions, opinions, and views of the green supply chain management system and their day-to-day practices. Interviewees were allowed a degree of freedom to explain their views, as well as to enable certain responses to be questioned in greater depth (Bryman, 2016).

3.5.2.3 Interview Process

Prospective respondents were approached by a personalized email, followed by a telephone call in order to explain the purpose of the study and to schedule appointments for the interview session. All interviews took place at the interviewees' work places and were mostly held with one respondent at a time with a few exceptions where a part of the interview or the entire interview was held with more than one interviewee. The interviews included several sessions and were directed to different respondents in the same organisation covering different roles along GSCM.

In all the cases the whole conversation was tape-recorded in order to improve validation of data. In parallel, written notes were taken by the interviewer. In order to ensure ethically correct conduct of the research, respondents' consent was asked for prior to the start of the interview (Robson, 1991). At the end of the interview the respondents were once again asked to confirm the permission to use the recording, as Stafford and Stafford (1993) suggest. The respondents were fully informed about the true purpose of the research and all people who would have access to the recording (Malhotra & Peterson, 2001). The interviews were transcribed and the obtained data

were coded. All data collected protected the privacy and confidentiality of the individual respondents. This was declared prior to interview and maintained by good records management after the interview.

Before beginning the process of collecting evidence a case study protocol was developed, an example of which can be seen in Appendix C. The main aim of this protocol was to increase the reliability of the case study by guiding the researcher in carrying out the data collection (Yin, 2009). All interviews were held in Greek language as it helped to build trust and make the interviewees more comfortable to talk.

As depicted in table 3.1, during a total of 11 visits to five different companies a total number of 18 interviews were conducted with a total of 17 interviewees from different levels of management and departments. All interviews and company visits took place in the time of March to June 2010. On the occasion of the company visits that all took place during regular working hours there was also plenty of opportunity to see the facilities and have contact with staff.

A more detailed table including the position of the interviewees can be found in Appendix F. In all the cases the whole conversation was audio taped in order to improve validation of data. The interviews were transcribed verbatim and supplemented by further sources of evidence, such as in-house documentation, media coverage and direct observation through visits to the facilities.

Table 3.1 Overview of conducted interviews

Company	Interviews	Interviewees	Visits
Case study 1 - Company A	5	5	3
Case study 2 - Company B	5	5	2
Case study 3 - Company C	4	3	2
Case study 4 - Company D	2	2	2
Case study 5 - Company E	2	2	2

For the interviews, an interview guide was developed to help the respondents understand the purpose and background of the study. To all interviewees the interview guide was made available prior to the interview together with some introductory note and relevant background information. A pilot interview guide with the interview questions was given to some selected persons from industry and academia. Through discussion valuable feedback was received which helped to improve and finalise the interview guide and interview questions. The interview guide with the introduction can be found in Appendix D.

The same interview guide was used for all the interviewees, persons in various positions in the same organisation, depending on the particular focal company, ranging from CEO, financial officer, executives in procurement, sales, customer relations, supply chain, logistics, manufacturing, operations, product, marketing and/or head of environmental issues.

The interview guide included, among others, questions referring to the company's environmental strategy, the driving forces and impediments for engagement in GSCM, the way green knowledge was managed, the environmental management practices inside the organisation, the green practices beyond the company's boundaries, environmental performance, and value creation. The fit of the interview guide with the research question can be found in Appendix E. The use of pre-defined thematic areas in the interviews, inspired by literature, do not contradict the method ontology as they did not "prevent the researcher(s) from allowing the categories and dimensions emerge from the data collected", as explain Bernon et al. (2011, p. 487) in their research.

3.5.2.4 Observations and Triangulation

In case studies research it is a common strategy to include data from multiple sources. According to Yin (2009), drawing on a variety of sources allows the researcher to provide a richer and more detailed picture and at the same time makes the results and conclusions of the research more accurate and convincing. According to Preuss (2005) such additional sources of information can be found inside the companies in form of:

> “annual environmental and financial reports, environmental policies, supplier evaluation questionnaires, internal newsletters, purchasing policy documents, vendor evaluation forms, access to the electronic ordering system, or promotional material.”(p. 151)

As external sources of information the same author names “reports by government departments, regulators or the media” (p. 151).

The interview data of this research were supplemented by further sources of evidence, such as as in-house documentation and publications as well as direct observations through visits to the facilities and direct contact with employees besides the interviewees. Documentation and observations can complement in further detail what was found out in the interview process. Given the qualitative nature of most of the data sought, triangulation technique provides a stronger validation of the results (Yin, 2009). Also Creswell (2013) confirms that the main purpose of that triangulation process with other sources and data collection techniques is to ensure validity and reliability of data.

3.5.3 Secondary Data Collection

In order to gain the necessary background knowledge a thorough literature search has been conducted which also allowed to put the findings from the analysis of the primary data research in the right context. Sources were books, scientific journals, conference proceedings, country reports, statistical reports, websites, and others. Literature research was done by consulting major databases, such as EBSCO, ScienceDirect, Google Scholar, Scopus, Web of Science. As keywords were used management and supply chain terms, such as ‘supplier selection’, ‘marketing’ or ‘performance’ with the combination of ‘green’, ‘environmental’ and ‘sustainable’. A more detailed list of the major keywords and major journals can be found in Appendix A. The found articles were classified in a taxonomy table, an example of which for some key articles can be found in Appendix B.

3.6 Data Management and Analysis

A method suggested by Miles and Huberman (1994) for building theory from case study data which is close to the social constructionism paradigm was used for the data analysis (Saunders et al., 2015). The main research objective was to identify issues in the areas of GSCM implementation. This was the basis for a within-case and a cross-case analysis. Each interview had as its main objective to identify issues that should be considered in the implementation process of GSCM. One subcategory of issues was related to the collection, administration, usage and diffusion of knowledge relevant to this implementation process. First, a detailed case study write-up was produced after each company visit to allow data analysis within each case. The interviews were transcribed verbatim. The hand written notes were examined.

Units of general meaning were outlined. Units of meaning relevant to the GSCM issues raised in the research questions and based on the literature and on actual terms used by interviewees were delineated. Units of relevant meaning according to the GSCM practices were clustered. Themes from clusters of meaning, and the identification of general and unique themes from the interviews were determined. The major identified themes and sub-themes are shown in figure 3.3. Quotes were integrated to illustrate key points. Open-ended answers were subjected to content analysis which allowed replicable and valid inferences from data to their context (Miles and Huberman, 1994). Cross-case patterns were examined where the data demanded to be looked at in many divergent ways. These included the selection of categories or dimensions for detecting intergroup similarities and intergroup differences. There was no need to use specific software to support the process of analysis. Matrices were developed to summarise the findings, to enable comparison across the data and to make appear possible patterns that emerged from the findings. The analysis was conducted iteratively through the course of data collection. Findings were triangulated across data sources.

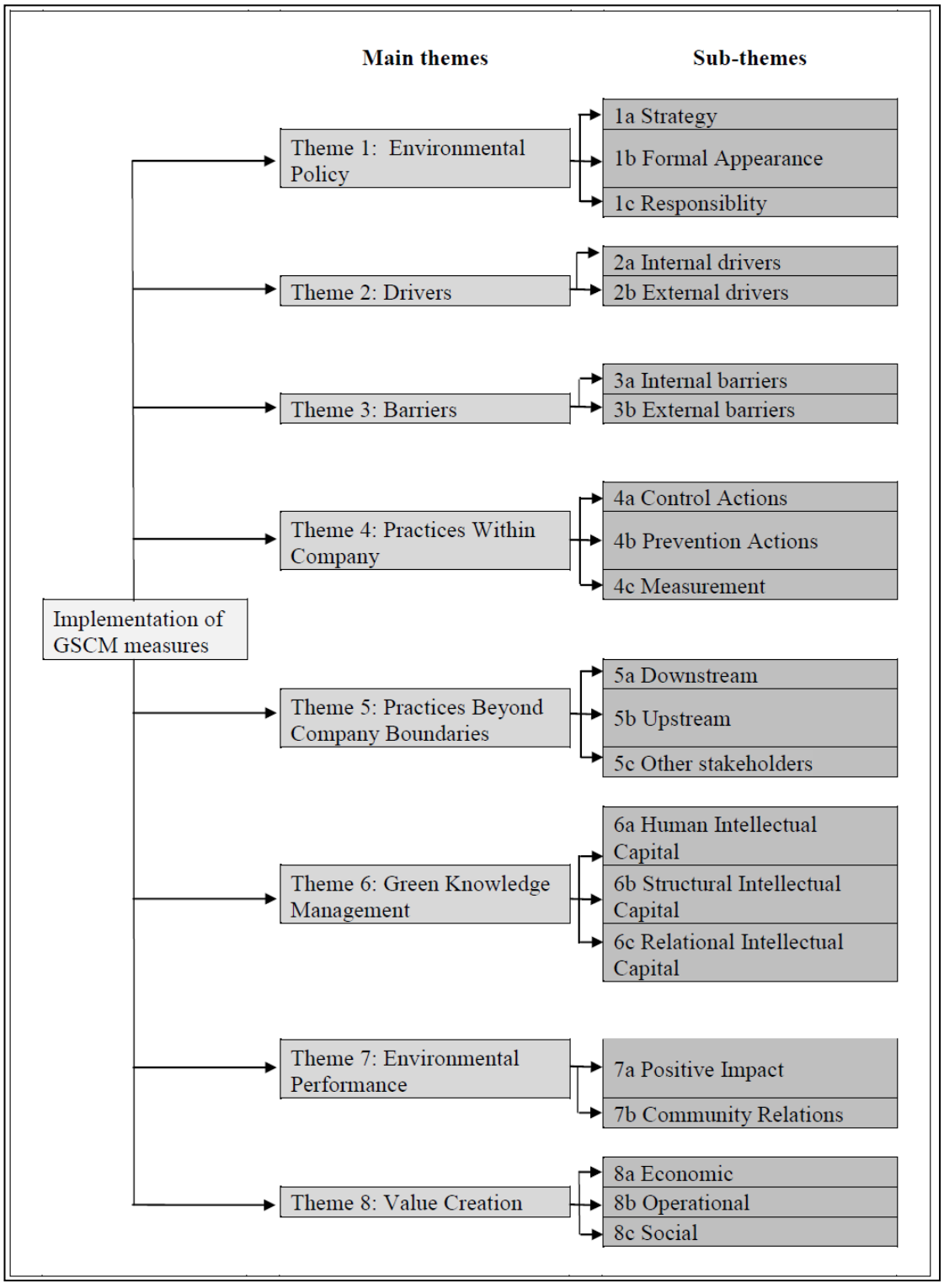


Figure 3.3 Themes and sub-themes of data analysis

3.7 Ethical Issues

Throughout the entire research process it was ensured that ethical issues were well observed, as recommended by Cooper et al. (2009). As Sekaran (2006) suggests, the interviewees were informed well in advance of the actual interview that their participation was completely voluntary and that they could withdraw from the process at any time without any consequences. Having been familiarized with the purpose and background of the research respondents were assured that principles of confidentiality and data security would be strictly observed. The participants were assured anonymity. They were asked for their consent to have the interviews auto-taped. In several cases an interview was interrupted by a phone call in which case the audio-taping was interrupted for the duration of the phone call and the author asked the interviewees if they preferred him to leave the room for the duration of the phone call.

The access to the data retrieved from the interviews was restricted to the author of this thesis throughout the transcription and translation process as well as in the process of analysis. In all publications of articles referring to this research the principle of anonymity was guarded.

3.8 Conclusions and Summary

This section presented and discussed the main methodological issues that have been followed in this research. The reasoning for adopting a qualitative inductive interpretative exploratory research approach was laid out. As the appropriate research strategy the multiplie-case study method was chosen in order to explore, understand and explain the wide variety of factors related to the implementation of GSCM practices and its consequences. This research has applied an in-depth case study approach of five selected enterprises. The in-depth cases studies allowed the collection of rich empirical data. Qualitative one-to-one semi-structures interviews constituted the primary method of data collection. The data was triangulated with information from company publications and on-the-spot observations. For data analysis gathered information was coded, categorised, abstracted, compared and interpreted. Ethical issues of respondents' confidentiality and data security were observed throughout the entire research process.

CHAPTER 4: FINDINGS

4.1 Introduction

In this chapter the findings of the five case studies are presented. Firstly, the company profiles are given. The outcomes of the various interviews, triangulated with the findings from business reports and other company publications, as well as first hand impressions from the companies' facility sites are presented in relation to the identified main and sub-themes of the analysis.

As laid out in figure 4.1, the analysis of the primary data leads to a summarized table for each thematic topic. From these thematic tables a framework containing the crucial success factors for effective GSCM implementation in the Greek manufacturing industry is created. This framework will then in the following chapter five be compared to the existing frameworks described in the literature review (chapter two, section 2.3).

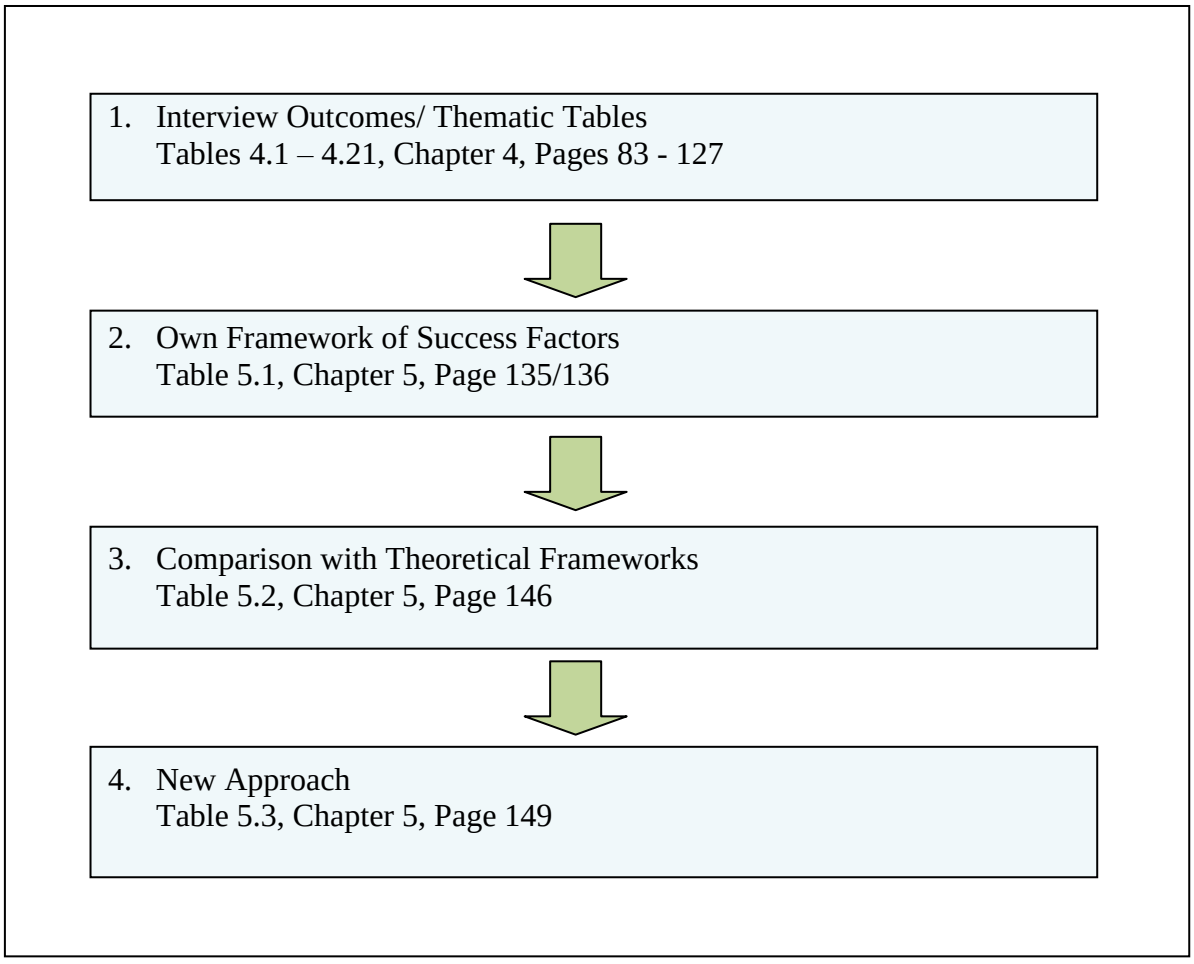


Figure 4.1 Overview of findings analysis

4.2 Overview of Themes and Subthemes

The data analysis resulted in eight main themes, as described above in table 3.3, namely the environmental policy the companies pursue; followed by the drivers for implementing GSCM measures; the barriers they face in the process of implementing those measures; the practices of GSCM they implemented within company boundaries; the practices the companies implemented beyond their own boundaries along their supply chain and in the community; the way they manage green knowledge; the environmental performance that they achieve by implementing those GSCM measures; and the added value that they have achieved to create for their companies in regard to economic, operational and social performance.

4.3 Company Profiles

The research was done with in-depth case studies of five selected companies. The companies are all from the manufacturing sector covering various fields of manufacturing, including manufacturing electronic and electrical devices, manufacturing building chemicals and pre-mixed mortars, producing high quality kitchen and bathroom products, manufacturing elevator parts and complete elevator systems, and industrial fruit processing and canning. All companies have their headquarters in Northern Greece.

4.3.1 Case Study 1 - Company A

Company A is a manufacturer of electronic and electrical devices, in particular of electronic security and emergency illumination systems. Product categories entail emergency lighting, fire detection systems, gas detection system, burglar alarm systems and electronic room thermostats. Founded in 1979 the company's headquarters are located in the Northern Greece in the region of Central Macedonia, near Thessaloniki. It employs a total of 165 people, and its annual production is more than 600.000 units. Company A's turnover was 12,8 million euro in 2013. The company is a dominant player in the Greek market where it covers the entire country. It has also branches in other countries of the region of South East Europe, such as Bulgaria, Romania, FYROM

and Albania. The company's total distribution network extends to 72 countries, where the following regions are the most important ones for export: U.S.A, East European & Central European countries, European Union, Balkans, Arab countries. The company has its own Research & Development department.

4.3.2 Case Study 2 - Company B

Company B is a manufacturer of building chemicals and pre-mixed mortars. Founded in 1980 the company has its headquarters in Thessaloniki and subsidiaries in Athens, Romania, Bulgaria and Serbia. It employs a total of 300 people of which 60 are working in the subsidiaries outside of Greece.

Production includes a total range of about 220 products. Products fall into in two major categories. There are powders and dry mix on the one hand and liquid products on the other hand. The company's products include: waterproofing materials, concrete and mortar additives, tile adhesives and grouts, repairing materials and paints, premixed plasters and industrial floors. The production capacity is 1500 tonnes of dry-mix mortars per day. It has fully automated production and packaging lines. It has its own R&D laboratories for developing new innovative products. Company B runs automated warehouses, both in Greece and abroad and has a wide spread network of transport agents. The company exports its products to many countries of the SEE region but also to Russia, Ukraine, Sweden, Georgia, Malta, Saudi Arabia, and the Middle East. The company's sales network contains about 1500 points of sale. The company's customers entail construction companies, wholesalers - distributors and DIY retail chains. The company's departments entail: Production, R&D, Quality Control & Assurance, Technical Support, Sales, Purchasing, and General Management. The turnover of the company is 35 million euro in 2013. Imports come from the U.S, Asia and from the EU.

4.3.3 Case Study 3 - Company C

Company C is a producer of high quality kitchen fittings and bathroom products. It was founded in 1959. Its headquarters and production facilities are located at the outskirts of Thessaloniki in Northern Greece. The company's manufacturing facilities, warehousing & administration cover an area of approximately 30.000 m². Company C

employs a total of 450 employees. Its turnover was 44,2 million euro in 2013. Its products include kitchen fittings and appliances, cookware and bathroom products, stainless steel sinks, pyragranite sinks, and kitchen taps. The annual production volume is more than 1,200,000 sinks. The company exports its products into more than 60 countries worldwide through an exports sales network with nine company- owned subsidiaries in UK, Germany, Russia, Poland, United Arabic Emirates, India, Italy, Bulgaria, and Romania. In the company's manufacturing process a wide range of production equipment are used, such as presses, laser machines, welding robots and automatic welding and folding machines.

4.3.4 Case Study 4 - Company D

Company D is a manufacturer of elevator parts and complete mechanic and hydraulic elevator systems. The company was founded in 1983 and started operations in 1985. It has its headquarters in the industrial zone of Kilkis in Northern Greece. Showrooms and warehouses operate in Athens and Thessaloniki. Other offices and trade subsidiaries are located in 13 territories serving 98 countries worldwide. The company has manufacturing facilities in Greece, China and Serbia. Company D employs today a total of 850 people. The company produces more than 12.000 new systems annually and is one of the largest lift companies of the lift industry in the European and international market with an output of around 3 % of the world's new lift installations annually. The company holds 73% of the daily market of Greece. It also provides renovation and refurbishment. Turnover of the mother company was 75,8 million euro in 2013, while for the entire group for the same time period it was 94,8 million euro.

In Greece, the company manufactures whole elevator systems in three factories. In one factory the lift cabins are manufactured. The second and oldest factory manufactures two different elevator systems: the mechanic one with cords and the hydraulic one with the cabin ascending and descending by oil pressure, the latter one not having the capability to ascend as high as the former one. For the hydraulic system, the tube, piston and cylinders are manufactured and processed, for the mechanic system the mechanical components together with the cables for the lift are manufactured. Suppliers for the mechanisms are located in Germany, Spain, Italy or China. The third

factory makes the controller of the elevator, the electronic board that gives the orders. In 2010 the company completed the installation of a new test tower for their elevators.

Company D has also formed a group of four international subsidiaries: a manufacturing company of automatic lift doors, which is a joint venture with a Spanish company with head offices and unique production unit next to the company's headquarters in Greece, a trading lift company located in Istanbul, Turkey; a Serbian trading and manufacturing lift company, as well as a Romanian trading lift company. There the company supplies the parts and the assembling is bought in place. Latest subsidiaries are a manufacturing company in China to enter the Chinese and Far East market, as well as two trading lift subsidiaries in UK and Russia.

Company D has the following departments: Finance & Accounting, Human Resources, Engineering, Purchasing, Planning, Marketing, Sales, Electronics and Automation, Industrialization, Quality Control, Production of Hydraulic and Traction Lifts, Quality Assurance, Distribution, Customer Support, Production of Cabins, Warehouse and Operations, Information Technology.

The company has one main competitor in Greece. Competitors abroad are also partly the company's customers at the same time due to the fact that for execution of orders in Greece it suits them better to have the work done by the Greek company with cheaper costs and having also the necessary service. Company D exports to more than 98 countries, the main markets being Belgium, UK, Ireland, Germany, Holland, Turkey, Cyprus, Russia and New Zealand.

4.3.5 Case Study 5 - Company E

Company E is running an industrial fruit processing and canning complex. It is an association of three agricultural cooperatives, with a total of about 2.200 fruit growers and covering a total area of around 3.200 hectares in the region of central Macedonia, Greece. The history of the fruit growers goes back to the late 1920s. They also engage in fruit and vegetable packing as well as frozen fruits and vegetable. Major sorts of fruits being grown, processed and packaged are peaches, pears, apples, nectarines, cherries and kiwis. The company has a total capacity of 30.000 tones of peaches and 4.000 tones of pears. The total annual production on the basis of 24 x 1 kg

cartons is 2 million cartons peaches and 500 thousand cartons fruit cocktail and 50.000 cartons pears. The company has more than 300 customers and exports in 50 countries. Its main markets are the UK, Scandinavia, Germany, Italy and other European markets. The company is also exporting to USA, Canada, Russia, Latin America, Japan, Korea and others. The company's production area covers about one hectare, its warehouses about 2,2 hectares. The company has cool stores of the total size of 4.500 m3. The company's water treatment system covers 0,6 hectares. Company E has also an organic peach farm of the size of 6 hectares.

The main working season for company E is the summer time, in particular the peach harvest period from July to September, when there are 600 people working in production per day in three shifts. After the peach harvest period there comes the pear harvest with a smaller quantity and 150 workers per day. Finally during the fruit salad production that lasts for 9 months and includes also home grown kiwis, about 60 people are working per day. On top of production there are 30 people working in labeling all year round. With 35 people as permanent employees, 30 who work at the labeling machine and around 60 in the fruit salad that lasts for 9 months, there are about 120 to 130 people who work 10 to 11 months a year. The fruits are gathered by the three cooperatives of the association. The raw material, for example the peaches, are cleaned, peeled, their kernel is removed, they are sorted by the desired quality, and they are canned, sealed pasteurized and stored.

The company's headquarters are located near Veria in Northern Greece. Additionally company E rents two warehouses nearby. With their own trucks the harvested fruits are brought to the main production facility where they are processed, canned, labeled and then dispatched for exports. After preservation the fruits can be kept in cans for three years in the warehouse. The factory works 500-600 tons a day.
The turnover of the company for the cans alone is 30 million Euro. Together with the fresh fruit business the turnover rises to 60 million Euro.
For the fruit which is preserved the production is 40000 tonnes. At the headquarter 35000-38000 tonnes are processed and the rest in another facility.

There are various sorts of peaches for the different desired purposes and markets, such as the 'hard core' peach with a more difficult to remove kernel for

canning and the ‘soft-core’ peach for the fresh market with around 15000 tonnes. Kiwi production and processing is 50000 tonnes.

4.4 Environmental Policy

The first main theme that has been identified in the data analysis is the environmental policy that is followed by the companies. This relates to the role that environmental issues are playing in the companies’ overall business strategy, how this policy is formally presented, and who takes responsibility for implementing this policy.

4.4.1 Strategy

The first sub-theme of environmental policy is the company’s strategy focusing on the question how big a role environmental issues play in determining the company’s overall business strategy in comparison to other strategic goals, such as primarily economic ones.

As a matter of fact, none of the companies gives strong emphasis to ecologic goals within its overall business strategy. While three of the case studies demonstrate a rather weak environmental strategy the other two give some importance to green concerns in their business strategy. The major strategic goal in terms of environmental friendly actions is to follow existing environmental laws and regulations in order to avoid harsh consequences. As the quality assurance manager of company A said:

> *“Regarding the regulations of REACH, they came to Greece one and a half to two years later after having been implemented on EU level. An information letter from the Chamber of Commerce was sent to us and other manufacturers with the message that compliance with the regulation was needed within 3 months or exclusion from import, export, and other activities was imminent.”*

Companies A, B and C make it also a point to follow the ecological demands of their big (foreign) customers as they understand that their compliance with these requirements is essential for their staying in cooperation. As the director of marketing of company A gives an example regarding the motivation for introducing ISO 14000:

"Regarding the issue of the environment, once we said that we have the ISO 14000 we automatically gained 5 points and we got an evaluation of 65 out of 100, where they have the range of 0-50 as the cut-off limit, where the break off the negotiation. From 50-75, 75 is the yellow line where they tell you okay but you need to make an improvement action plan, and from the green and higher where they tell you okay. We were in the yellow range with the 5 points that we gained from the ISO 14000. If we had not that ..."

All companies state that they would engage in GSCM if the market demands so and it would create a positive market response. The purchasing manager of company B explained:

"We make this product that they are asking for, depending on the volume that this market will consume, if it is worth it, we go on and create a product that will meet this customer's requirements."

This economic aspect is confirmed by the director of marketing of company together with the claim that not 'greening' their actions is the dominant strategic goal but rather 'innovation'.

"An environment friendly attitude is important but to what extent? If it creates additional costs does it interest us? It will show in the market. If it generates for us new and better customers, it is fine. If it creates costs ...? The policy in our company is that 'the horse pulls the carriage' for the very simple reason that we stay innovative."

In a similar way in company B the guiding strategic principle is not 'green' but 'quality'. The company aims to achieve a high standard of quality in whatever they are doing. If this means that the outcome is also good for the environment then this is a welcome effect. Nevertheless a more important aspect is the question if an action can have a cost saving effect. This economic principle plays in general also a dominant role in company C and D. As the commercial director of company C declares:

"There is some difficulty to be able to combine the environmental friendly with the economic."

The production manager of company D finds even clearer words:

"Regarding measures for reducing the amount of waste, improvement of machinery, for energy consumption, oil, etc., we have all that but only for cost reasons. For example when this month with this machine I burnt 90 kilowatt

hours instead of 100 kilowatt hours, I will not think that I have spared the residents of Ptolemais [village near the factory]10% carbon dioxide and ash, but I will think that I will pay less. No Greek company and nowhere else in the world I think, businesses would think this way. Each one individually sees it differently. But inside a company, the employees cannot see it ecologically."

Company E operates an integrated production management system entailing all farmers and their fields as well as the dealers of pesticides and fertilizers. The system has been implemented with the strategic goal of achieving economic as well as environmental benefits. While biological farming is not within the strategy of company E due to a lack of economies of scale, the company understands the need for environmental protection, such as safety of underground water, out of its own experience, as the general manager explains:

"We, the farmers spray and drink water from wells that we thought had the best water. Because when I measured at 100 feet depth for nitrates, I saw that water had 100 ppm, while the maximum is 15-20. So we harmed our health and our pockets. ... The state obviously measured and knew that the water was contaminated with nitrates, but did nothing."

The displayed strategic orientation results in company A and E in some proactive approach towards GSCM, while in companies B, C and D a more reactive attitude is observed. This certain lack of demonstrating a more active ecological attitude becomes obvious in the statement of the production manager of company B:

"Many times we are below these limits [for ecological labels], - of course unintentionally."

Except of company E the overall business strategy also does not lead to any particular engagement in environmental matters in the community. The commercial director of company C said:

"We do many things for social responsibility but not in regard to green matters. The company does not link any particular support actions to the green thought, I think."

The outcomes of the case studies in regard to the applied environmental strategy are summarized in table 4.1.

Table 4.1: Role of environmental values in overall business strategy

ENVIRONMENTAL POLICY	Company A	Company B	Company C	Company D	Company E
Green Strategy	Some importance (follow regulations; respond to (important) customer demands if it creates market response; guiding principle is innovation; no particular community engagement; some proactive actions	Weak (follow regulations; respond to (important) customer demands if it creates market response; guiding principle is quality; if it saves costs; no particular community engagement; rather reactive approach)	Weak (follow regulations; respond to (important) customer demands; marketing tool; economic principles first; no particular community engagement; rather reactive approach)	Weak (follow regulations; respond to market demand; cost saving is at first place; no particular community engagement; rather reactive approach)	Some importance (follow regulations; integrated management system; balance with economic principles; proactive actions; community engagement)

4.4.2 Formal Appearance

How strong a role the ecological strategy plays in a company may also be reflected in its formal manifestation. In the examined case studies in general a rather informal appearance of green principles can be observed. In particular, there is in most cases no formal way to communicate any green principles towards stakeholders beyond the company boundaries. But also for the stakeholders within the companies green guidelines are rather a matter of conveying an informal awareness. As the marketing manager of company B explains:

> *"Our overall sensitivity for the environment also shows from the way we have set up our space. And it plays a role, because not all have a lot of green. We want to keep some basic principles."*

Three of the companies have applied and (partially) implemented ISO 14000 but there are no formal green strategy plans or mission statements available. Even if in the general business strategy plan there are included some general terms regarding the protection of the environment further specifications are missing, similar to the message conveyed on the website of company D:

> *"We recognize that respect for the environment is an investment, not an obligation."*

The general manager of company D announced that they would put further details online. The companies have to report some environmental measures to the state

authorities, such as the regional prefecture or the ministry, as well as in some cases to their bigger customers. Companies A and D do not apply any formally written evaluation procedure for their suppliers.

Instead of a following a formal strategy some of the companies declare that they follow an environmental policy because:

> *"... this is the philosophy of the management and because that is how we have learned how to do it."*(general manager of company D)

> *" ... What we do, we do it by intuition."* (marketing manager of company B)

Company E does not have a mission statement reflecting its environmental strategy but has included its major environmental strategic goals and principals in an internal policy paper which is meant to be the guideline for all operations for the company and its affiliates.

The outcomes of the case studies in regard to the formal appearance of environmental goals are summarized in table 4.2.

Table 4.2: Formal appearance of environmental goals

ENVIRONMENTAL POLICY	Company A	Company B	Company C	Company D	Company E
Formal Appearance	Informal (ISO 14000; no formal strategy plan; no green mission statement; no formal supplier evaluation); Formal (ISO 14000 application)	Informal (no ISO 140000; no formal green strategy plan; no green mission statement; follows 'intuition'; no external communication)	Informal (no formal green strategy plan); Formal (ISO 14000 implemented)	Informal (no ISO 14000; no formal green strategy plan; no formal supplier evaluation)	Informal (no formal green mission statement); less formal (internal policy paper); formal (ISO 14000)

4.4.3 Responsibility

In order to implement an effective environment friendly strategy it is also important to understand where the responsibility for these matters is placed within the company.

In most companies it is the top management that is responsible to formulate environmental strategic goals together with the heads of various departments, such as marketing or production. In others it is task of certain departments, such as R&D or quality assurance & control.

In company A it is foremost the R&D department that initiates environmental measures. In general, suggestions for improvement can be done by employees to their next level manager. In regard to green issues this seems to not really be practised though. The company also sought the help of an external consultant in the process of the application for ISO 14000. The responsibility for the implementation of the ISO requirements lies with the quality director and afterwards for inspection with the procurement department and the production director. In company B the responsibility for environmental issues lies with the director of quality assurance and control. In company C it is the top management that installs environmental consciousness in the first place. Decisions about implementation are made with the directors of the various departments, in particular marketing and production. The marketing director has an active role in initiating environmental activities. In company D the top management initiates the efforts for environmental innovations. As the production manager puts it:

> *"It starts from the management which pulls the rest of the company. Management wants us to be first and gives us the funding. The management pushes the company for innovation."*

The outcomes of the case studies in regard to the responsibility for formulation of environmental goals are summarized in table 4.3.

Table 4.3 Responsibility for formulation and implementation of environmental goals

ENVIRONMENTAL POLICY	Company A	Company B	Company C	Company D	Company E
Responsibility	Departments R&D, Procurement	Department Quality assurance & control	Top Management; Depts. Marketing, Production	Top Management, Sales Dept.	Top Management, Department Quality assurance & control

4.4.4 Summary of Environmental Policy

In all interviewed companies it appears that there is a lack of a clearly formulated environmental policy. There is no support from the state but hurdles that need to be overcome. The market appears not to sufficiently appreciate a company's environmental strategy. One of the major criteria is compliance with regulations, then economic targets, what does market appreciate, then reflection on ecological feeling.

The outcomes of the case studies in regard to the first thematic topic 'environmental policy' are summarized in table 4.4.

Table 4.4 Environmental policy followed by companies

ENVIRONMENTAL POLICY	Green Strategy	Formal Appearance	Responsibility
Company A	Some importance of green values	Mostly informal with some formal aspect	Department level (R&D, Procurement)
Company B	Mostly weak role of green values	Mostly Informal	Department level (quality assurance)
Company C	Mostly weak role of green values	Mostly informal with some formal aspect	Top management & Department level (Marketing, Production)
Company D	Mostly weak role of green values	Mostly Informal	Top Management, Dept. Sales
Company E	Some importance of green values	Mostly informal with some formal aspect	Top Management

4.5 Drivers

The second main theme of the data analysis concerns the drivers that motivate the examined companies to undertake green actions along their supply chain. These drivers can be internal or external.

4.5.1 Internal Drivers

The reasons why the interviewed companies think of and implement environmental friendly actions are partly found within the company's boundaries.

Regarding internal drivers in all five companies the values of the owners and top level management play a vital role. Although in none of the interviewed companies the expressed values are directly focused on green measures they support their implementation in the wider context. Company A and D express a strong belief in seeking constant innovation and quality. In this overall philosophy the awareness of green issues is embedded. The management of company B take it as a personal value to "do things right", as the technical support manager puts it. If this means that a product can be made less harmful towards the environment, then they try to take this factor into consideration. Company C also holds up ethical values of conducting business in a way that takes into account environmental concerns where possible. Based on these values the company decided for example, to install a system to check on fresh water leakage to minimize the use of the natural resource in spite of the fact that it does not pay fees for its water consumption.

Companies B, C and D name also cost saving effects as an important driver for implementation of GSCM. Companies A and B cut costs by reusing the raw material that was wasted during the production process. Through the acquisition of new more efficient machinery company C can reduce the quantity of machine oil and lubricants used in the production process, thus cutting expenses on raw material and for waste removal. Company C's exposed location in an environmentally sensitive area urges them to be particularly careful with the management of their waste water. Companies A and B see the implementation of GSCM also as a chance to attract new international clients with a heightened environmental consciousness. Company D emphasizes the strength of its two R&D departments which allow it to recognize market trends early,

including environmental friendly products. For company E cost savings, reduced consumption of energy and water, as well as health protection are internal motivators. Also ethical values and the drive for better quality products encourage the company to take some GSCM actions.

4.5.2 External Drivers

Regarding external drivers, in all five companies EU environmental legislation plays a crucial role. Even though, adaptation of EU environmental law into Greek national law may come with a delay, once in force it puts great pressure on the companies. As the general manager of company E says:

> "Regarding the environment we look at what is important to us, the pollution, where there is legal obligation. In the operating license there is also the limit for pollutants that we are allowed to throw into the canal and our goal is to be below that limit in order not to have fines when they control us. That is the most important to us."

The companies that are preparing themselves in a proactive way on time for the coming regulations find it then easier to adapt themselves to the new legal situation, as did company B, when they insisted on their supplies' conformity with REACH even before it became national law. An important factor for all companies is also the environmental legislation in the countries to which they export. All companies also conduct market research where occasionally green issues are examined in the context of competitors' activities and customer interest. If market research shows demand for a green product or new green technologies pushed forward by competitors the company's management together with R&D and other departments examine the option to follow that new course.

On several occasions companies A,B,C and D also face direct requirements by their customers, usually the bigger ones, to discuss implementation of environment friendly elements into their products and processes. The more important the client is the more willing the company is to respond to the request. This way company C, for example, reacted to the demand of one of its biggest customers to introduce pallets made out of recycled paper instead of wood. Company D responded to the demand of its clients from the public sector by providing its products with biodegradable oil.

Company A and C take the environmental audit done by their big customers as an obligation and to react to the criticism expressed and as an incentive to think about implementation of related steps along their supply chain. If such environmental audits are not satisfactory the companies can lose the order to competitors. Company B's dialogue with suppliers leads to new ideas for green actions if they seem to conform with other factors such as cost control and market demand. Pressure groups do not play any role for Greek companies. Company E takes also advantage of relevant EU support programmes to implement GSCM measures.

4.5.3 Summary of Drivers

The outcomes of the case studies in regard to the second thematic topic 'drivers' are summarized in table 4.5.

Table 4.5 Drivers for implementation of GCSM practices

DRIVERS	Company A	Company B	Company C	Company D	Company E
Internal Drivers	management values				
	cost savings				
	company strategy of innovation			strong R&D departments	
		company strategy of quality			better product quality
External Drivers	EU /national environmental legislation				
	market research				
	customer demands				
	export country environmental legislation				
	(international) competition				
	environmental audit by big customer	suppliers' suggestions	environmental audit by big customer		environmental audit by customers
			production facility located in environmental sensitive area		
	to attract new international clients				
					EU support programmes

4.6 Barriers

Regarding the third theme ‘barriers’ there are a number of internal and external impediments that prevent the companies from the implementation of green management measures along their supply chain.

4.6.1 Internal Barriers

As one of the major internal impediments the five companies name the concern about increased costs. As the commercial director of company C declares:

> *“The cost-benefit analysis makes it sometimes difficult to account for environmental issues.”*

Many companies do not publish green reports which would be an incentive to pay more attention to GSCM. The lack of necessary resources prevents company D from participating in national and European green initiatives and projects. All companies also put forward that green issues do not rank as high as other strategic goals.

Also some resistance in employees to adopt a new mind set is mentioned sometimes, as for example by the technical director of company C:

> *“Of course, some resist, but the young people understand.”*

4.6.2 External Barriers

As one the major external barriers all five companies mention the existing insensitivity of the Greek market to environmental issues and the resulting unwillingness to pay for greener but higher priced products. The logistics manager of company D explains:

> *“The biodegradable oil sells by double price and the market does not accept this. … The supplier says that he cannot produce a product that is both ecological and cheap. If he could though people would buy it for its cheap price and not for its ecological characteristic. Unfortunately, this is true for Greece.”*

Unawareness of the need to find ecological responses and therefore a lack of willingness to cooperate in these issues is also found in the business community according to companies C and D. Another factor that most companies mention is the low level of enforcement of environmental regulation through state authorities, which also leads to an unfair competition with many competitors not making the necessary expenses for the green measures required by law. As the head of production from company B puts it:

> *"Many of our competitors tend to circumvent environmental regulations and do get through with this behaviour due to lack of enforcement."*

This unfair competition also adds to the pressure of competitive pricing. Many companies also complain about a lack of state support for green initiatives, as described by the general manager of company E:

> *"There is no state support. We do this on our own initiative. Sometimes state employees help with such initiatives because they go beyond the usual but they have to know you and you need to convince them."*

The plant manager of company D goes even further by saying that the state does not only miss to support companies in their effort to implement green actions but hinders them through a high degree of bureaucracy and a lack of necessary infrastructure:

> *"The state does not help. Is it really possible that here we have an industrial zone and not have a central biological purification system? It is possible to be in an industrial zone and not have a standard power supply*?"

Companies A and D complain about the unwillingness of competitors to cooperate in issues regarding protection of the environment. Companies C and E claim that in some cases of green product design the monopoly-like position of suppliers prevents progress. Some of the companies also hint to the difficult situation caused by the international financial crisis that hinders prioritizing green measures in a company's business strategy. Company D considers also an impediment the gap between research institutions and industry that stalls innovation in green issues. Competitors

4.6.3 Summary of Barriers

The outcomes of the case studies in regard to the third theme 'barriers' are summarized in table 4.6 and table 4.7.

Table 4.6 Summary of internal barriers

BARRIERS	Company A	Company B	Company C	Company D	Company E
Internal Barriers	no green reporting			no green reporting	
		concern about increased costs			
				lack of resources in company to participate in green initiatives and projects	
				more important issues than green development	
			resistant mentality in employees		resistant mentality in internal partners
					lack of education of internal partners

Table 4.7 Summary of external barriers

BARRIERS	Company A	Company B	Company C	Company D	Company E
External Barriers	market insensitive for green issues/ high product price				
		low level of state control of implementation of law			
			high bureaucracy		
			low green awareness in business community and public opinion		
				green' is seen as a temporary fashion	
	government agencies slow in supporting initiatives		local authorities not very cooperative	lacking state support	
				lack of support to participate in national green programmes, high bureaucracy	
				lacking infrastructure	
	no willingness to cooperate between competitors on green issues		big suppliers' monopoly	Greek mentality of survival on its own, lack of cooperation	big suppliers' monopoly
		many competitors do not comply with law			
			economic crisis		
				gap between research institutions/ universities and industry	
					small market size
					resistance of suppliers

4.7 Practices within Company

The five companies undertake a number of green supply chain management actions within their company boundaries. These actions can be divided into control actions and prevention actions. Control actions aim to apply green actions to the waste created from business operations, such as recycling, whereas prevention actions are directed towards the goal to avoid the creation of waste in business processes, such as reduction of hazardous raw material for production.

4.7.1 Control Actions

All of the companies practice selective waste collection to give for recycling, such as plastic, paper, copper, steel and other materials. Companies A and B care for the disposal of toxic waste through specialized third parties. Company E has the special organic mud collected and went so far to produce its own compost from the (non-toxic) organic waste:

> "We produce compost, at 7 km, we keep the debris from the cannery, from the biological cleaning, from stables where we breed calves, from the olive mill and we make organic fertilizer that we sell to our members. It is very good for the kiwi." (general manager of company E)

While companies A, C and E have already received ISO 14001:2004 certification, company B is planning to do so within the next five years. Company D has no ISO 14000 certification and does not see the need for it. Company C has also an EMAS system in place whereas company A, after already having the ISO 14001 certification for a couple of years, has just started preparation for such an implementation through hiring a third party. All companies collect used machinery oil and lubricants to give to recycling. Company D also recycles all other liquid waste such as coolants and freezing fluids. Company E has a biological purification system, sells its defectives and waste paper. So do companies C and D that sell their scrap metal to be melted and reused. Company D also made an effort to find a clever way how to sell its used wooden pallets. As the plant director of the company explains:

> *"For example, when I first came to the company I realized that we threw away the wooden pallets that were broken or not used, and these were taken by the merchants who supply us. We sorted them out and threw them away. And*

they are many. They landed on the trash in [the prefecture of] Kilkis. Not only that they did not pay us anything but we had to pay them. So I found a supplier who pays a symbolic price of 2 Euros and we sell the pallets to him. So we have a profit and do not throw the pallets away and do not pollute the environment."

Companies A and B have on-site recycling programmes that minimize the waste rate of raw material used in the production process. Company B is giving office equipment, such as computers, monitors and telephones, which is replaced by new models, for further usage to second-hand users. Companies B and C use air filters and collect dust generated in the production process. Company A and B collect waste water and biologically purify it. Company B is planning to set up own water treatment installation within the next five years but until now the cost-benefit analysis with regard to the amount of waste water to be treated favours the solution of collection through a third party for disposal at the public water treatment plant.

Company B also found a way to further improve the efficiency of its collection of waste water by diluting the waste water enriched with chemical substances with the less aggressive sewage water from regular office usage. Company C reduces the conductivity of waste water to a degree much below the level required by state regulations.

4.7.2 Prevention Actions

Company D also uses biodegradable oil for its products when demanded by the customer. Company A is using heat generated from a cooling unit that would go wasted otherwise for heating its factory premises. A visit on the company premises confirmed the installation of apparently suitable pipes from the cooling machine to the factory floor. As the weather conditions did not demand additional heating on the day of the visit the described effect could not be felt in person by the author but was backed up by two employees whom the author encountered on the factory floor.

Company D has installed special natural gas radiators throughout the manufacturing plant. Company C has replaced a machine for lubricating product parts that had a very inefficient use of lubricants with a more efficient machine that reduced

the quantity of material used and of waste material to a large extent. Company C has also installed a system to check on fresh water leakage in order to reduce waste of fresh water. Both the new lubricating machine and the system for checking on water leakage have been inspected by the author on his visit of the company premises. The physical inspection confirmed the notion gained from the conducted interviews that positive environmental effects can be achieved independently of the level of invested capital, both with an expensive purchase such as of the lubricating machine and with a relatively cheap investment of rather simplicity such as several water meters in combination with an appropriate inspection plan.

Company D has installed more efficient and less energy consuming production machines. Company C replaced Styrofoam packaging material by more environmental friendly cardboard packaging material. Company A makes an effort to use in its products energy conserving light sources, such as LED. One of the tasks of company A‘s R&D department is to search for less environment damaging product designs. Companies C and D established good interdepartmental cooperation in order to handle more efficiently green issues. Company B recently installed a new production line which instead of assembly belts uses the force of gravity to forward material used in the production process. This measure reduces the required input of energy during production. The clever simplicity and evident energy efficiency of the system was impressively demonstrated to the author during an inspection of the company premises. The new set of machinery also helps to minimise the scrap rate. Utilisation of machinery is made more efficient. Large product orders are manufactured with a usage relation of old to new equipment of twenty percent to eighty percent. On the other hand, earlier considerations by company B regarding the replacement of conventional sources of energy through installation of solar cells have not been followed through due to negative cost-benefit analysis.

Company D has implemented in its products a special system for reducing energy consumption by up to 50%. For in-house transportation of material and goods, company B uses battery-powered forklifts reducing air pollution and improving work conditions on the production and warehouse premises. In the production process company B makes an effort to reduce the amount of chemicals used for cleaning the machinery. Similar goods and goods of similar colours are produced in close time

proximity in the production line. Hence, machinery has to be cleaned in lower frequency. Also the amount of chemicals used for cleaning machinery is reduced by applying an efficient water and pressure dosage. Company A replaced their paper containers for material handling within the factory with long lasting recyclable plastic containers and reduced by this way the amount of paper waste by a large extent:

> *"Cardboard boxes were changed to plastic boxes. Boxes are used to transport parts within factory back and forth. With the second time cardboard boxes got damaged and needed to be replaced. A lot of paper waste was produced and costs generated. This idea was discussed for quite some time but it was a cost issue but finally management decided to change to plastic boxes to avoid paper waste. The plastic boxes when they need to be replaced after years of usage, go to recycling. The boxes protect the material, do not allow dust to enter, fit neatly, are innovative."*(plant floor manager, company A)

A visit on the premises of company A confirmed the impression of durability and ease of use of these handy plastic containers for transporting and temporary storing of all kinds of smaller parts needed in the production process. The boxes seemed to allow besides better robustness due to their material also better visibility of the material contained in them due to their shape as well as better stackability.

Companies B and D have established bus transfer for their employees to the work place. For the construction of company B's administration building energy efficiency principles were applied, such as adjustment of sun impact to reduce energy consumption for heating and cooling. The latest effort of company B is the search for environment friendly package material for frequent transport of material and goods inside Greece. Company D's R&D departments track latest research developments regarding the ecological differences of hydraulic versus electronic elevator systems. Company E took measures to reduce the use of water, reduced number of water supplies and reduced energy consumption:

> *"We have made some electrical interventions, we have put some electronic systems and capacitors that help and you achieve reduction of electric current and now we discuss to place photovoltaic and there will be an economic benefit because we have space around the production facility."* (general manager of company E)

Some of the companies give educational and training seminars to their employees about environmental issues.

4.7.3 Measurements

The companies measure the defective rate in production. The energy consumption during the production process is measured although the energy consumption is not measured by production per piece. Company A does not have a full internal process quality control system in place and no written quality control forms. Control is done for the companies by the state authorities and/or by their bigger clients in regular time intervals. The consumption of raw material, such as petrol, oil, fresh water as well as solid and liquid waste are measured. Company C has achieved a considerable reduction of fresh water consumption by applying measurement, as explained by the technical director:

> *"We also count man-hours and the consumption of water that we are trying to reduce, looking for leaks in the plant with hygrometers. We saved 120 cubic meters that were gone every day with the leaks. We gave € 70.000 to do this and we have no profit because the water is taken from the earth, but we are doing good to the environment."*

Company E analyses soil and plant samples and monitors the irrigation system in the fields as well as fresh water quality in terms of contamination with pollutants.

> *"We monitor all our fields in our central computer and make sure to watch the watering systems and to change them because you cannot calculate the water that goes into each tree and waste is high. … We monitor all parameters of the system, we measure the water from Pomona that the famers drink and use for irrigation to see to what extent undergroundwater is contaminated."*
> (general manager, company E)

All companies are controlled by the state authorities and/or by their bigger customers in certain time intervals. In these controls they have to provide proof of certain parameters, such as consumption of natural resources, liquid and solid waste generation, measures from the biological purification system. Some companies, such as company E, have an integrated management system that allows monitoring and measuring many parameters against set benchmarks. Also company C has installed a system that determines yearly benchmarks and encourages management to follow the parameters closely. The technical director of company C describes the details:

"Once a week we measure the ground water level. And something else we measure once or twice a month is the waste water, the Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), pH, suspended solids, and others. We have in charts the limits given by law and we see where we stand. We measure consumables, electricity, petrol, natural gas, solid waste, paper, plastic, recycling of stainless steel, lubricants, sludge from biological purification, water, pH, COD, BOD, suspended solids, dust exiting the factory filters, metallic dust that we measure 1-2 per year."

The commercial director of company C explains the underlying reasoning:

"The philosophy of green development has to do generally with the philosophy of quality. Whatever is not of quality, creates cost. Whatever is bad for the environment, consumes energy, creates you cost. It is worth measuring what is energy intensive and costly, and you reduce it, and you become a greener and better person."

Other companies, such as company A, are still in need of such a system and hope to achieve better monitoring with the full implementation of ISO 14000. As the marketing manager of company B describes it:

"So far we do not follow an evidence-based tactics, measure and have indicators. This is ISO 14000. What we do, we do it by intuition. For example, we have high electricity bills, we do various actions with cheaper components, we made our new line to convey the material by gravity and not consume energy to go from one stage to another."

The companies do not in particular put their focus on the relation cost – benefit in regard to green measures. On a broad base they do not identify and quantify the added value that a green measure generates for the company and put that in relation to the cost that were required to implement that measure. One factor that plays a role in this context is that they do not define such a measure as 'green' in the first place. The purchasing manager of company D finds the following words:

"The first criterion we look at is the costs. We also look if something is ecological, but mainly we look if it is beneficial for us. There is no business to make social policy. The state is responsible for that. Businesses exist to make money."

4.7.4 Summary of Green Practices within Companies

The outcomes of the case studies in regard to the forth thematic topic 'green practices within company' are summarized in table 4.8 , table 4.9 and able 4.10 .

Table 4.8 Green practices within company – control actions

GREEN PRACTICES WITHIN COMPANY	Company A	Company B	Company C	Company D	Company E
Control Actions	selective waste collection				
	toxic/dangerous waste disposal				
	ISO 14001 certification	plan to get ISO 14001 certification within the next five years	ISO 14001 certification		
	preparation of EMAS implementation	plan to install a biological cleaning treatment plant in the next five years	implemented EMAS		
	collection of machinery oil and lubricants to give to recycling				
			giving out-dated material to further user	recycling of all other liquid waste such as coolants and freezing fluids	sell waste paper, burnt oils
	payment of third party to collect recycle material (paper, copper)	payment of third party to collect recycle material (paper, steel, plastic, office equipment)	payment of third party to collect recycle material (paper, steel)	recycling of paper, plastic, aluminium, batteries, lamps	recycling of batteries
		usage of air filters	dust collection	sale of scrap metal	sell defective tin cans
	on site recycling programme		sale of used wooden pallets		
		waste water collection and biological purification			
		improvement of efficiency of waste water collection	reduce conductivity of waste water		

Table 4.9 Green practices within company – prevention actions

GREEN PRACTICES WITHIN COMPANY	Company A	Company B	Company C	Company D	Company E
Prevention Actions	use of extra heat from cooling machine to warm factory premises	installation of more energy efficient production line machinery	replacement of inefficient lubricating oil engine	more efficient and less energy consuming production machines	reduced use of water, reduced number of water supplies
	research for use of less hazardous material		use of cardboard instead of Styrofoam	use of biodegradable oils	use of degradable tin containers as package material
	introduction of materials with lower environmental impact (LED)			implementation of a special system for reducing electrical energy consumption by up to 50%.	reduced energy consumption through electrical interventions
	change of container material for longer duration of usage	use of battery driven forklift vehicles within warehouse	good interdepartmental cooperation regarding green issues		
		changes in product and material specifications	installed system to detect fresh water leaks	management of thermal energy (natural gas radiators throughout plant)	
		firm staff training and awareness campaign			educational and training seminars for farmers
		transfer of employees by buses		transfer of employees by buses	
		efficient usage of equipment to avoid toxic waste			
		efficient usage of detergents to clean machines			
		modernisation of equipment to minimize scrap			
		modern energy efficient office building construction			
		search for package material with lower environmental impact			

Table 4.10 Green practices within company – measurements

GREEN PRACTICES WITHIN COMPANY	Company A	Company B	Company C	Company D	Company E
Measurements	failure analysis in design, process or material	defective rate is counted (benchmarking); not counted is the cost for correcting	defective rates are counted	measure scrap rate (iron & inox)	analysis of soil and plant samples
	energy consumption during production process, waste generation (scrap rate)	do not follow an evidence-based tactics	use of energy is measured	do not measure energy consumption per product manufacturing	monitor fields and irrigation system
	full internal process quality control system is not in place; no written quality control forms	control by prefecture for license renewal	once a month control by local authorities of biological purification system	measure raw material, emissions, recycling	monitor fresh water quality (contamination)
	no measurement of kw energy consumption per piece	some measures and indicators	ISO 14001 control, scorecard	measure for cost and health & safety of employees	measure pollutants parameters against set benchmarks
	is not counted how many defective pieces come back from each production lot		once a year strict control by big clients		measure petrol, oil, energy consumption, solid waste
	try to apply ratio measurements (16 in the new programme) to determine return rate of failure products with the goal to have not more than 0,75 per 1000.		inspection of records, certifications for waste management		records, statistic data, graphic charts for lubricants (quantities, suppliers), list of machinery, vehicles, inspections, presentations, remarks
	environmental ratios and measurements were verbally discussed in the process		proper separation of waste		

Table 4.10 Green practices within company – measurements (cont'd)

GREEN PRACTICES WITHIN COMPANY	Company A	Company B	Company C	Company D	Company E
Measurements	Cost-benefit ratios for green measures are not implemented yet		environmental benchmarks are determined each year and followed (energy consumption, petrol, gas, water, etc.)		
	measuring failure rate in plastic part production, but foreseen to be implemented (in board production they have measure in place		ground water level		
			quality of waste water (BOD, COD, pH, etc.)		
			measurement of consumables, electricity, petrol, natural gas, solid waste, paper, plastic, recycling of stainless steel, lubricants, sludge from biological purification, metallic) dust		

4.8 Practices beyond Company Boundaries

The GSCM measures that the five companies undertake do not end at the organisations' boundaries but go beyond reaching to suppliers, customers and other stakeholders in the community.

4.8.1 Downstream

Company A and C follow suggestions and requirements for the implementation of certain green practices along its supply chain from big (potential) customers from countries with high environmental standards in the framework of a company audit. The technical director of company C appreciates this kind of cooperation:

"The inspections [by clients] are more cooperative with the goal to improve the situation, they are performed regularly as standard requires, and in parallel there is an exchange how things can be improved."

Other companies, such as company D state that their smaller Greek clients do focus mainly on cost and price and generally are not interested in discussing environment-friendly improvements. With customers from abroad it depends on the country and the size of the company, as the purchasing manager of company D explains:

"There are companies that give you detailed specifications at all times and in such matters and there are others that work as the Greek companies. Let us say regarding the issue of ecology there is a trend in regard to the consumption of electricity and an international trend, how they can make lifts more "green". But it should be implemented here, as they put it on refrigerators and washing machines with classes A, B, C, D, etc. ... And we are in this line of thinking and we will do it. ... But yes, you could also take from the customer an idea and make it an innovation."

Company E provides REACH certifications from suppliers to customers. The general manager explains the role of their clients:

"They should be the outside eye that will monitor developments and the market and they will make suggestions to improve beyond your personal efforts and the efforts of the company. I believe that the systems and inspections are good."

But the manager also adds that environmental criteria and suggestions are only a few. The other companies have reported major GSCM practices implemented in the downstream supply chain channel.

4.8.2 Upstream

Company B has achieved through the close cooperation of its R&D department with smaller suppliers environmental friendly changes in product design by eliminating hazardous material. The company also takes information from its suppliers regarding technological innovations regarding green product design. But on the other hand the company does not have the market power to tell their main suppliers to introduce green

changes. Company A, C and D check their suppliers only in regard to them having the specific product certifications required by law, for example chemical products to prove specifications according to REACH, but they are not interested if their suppliers have implemented certain GSCM measures that would help improve the process. As the technical director of company C exemplifies:

> *"We want the products that we are supplied with to meet the standards we set ourselves. I do not care if the other has EMAS, I am interested that he meets the standards. What we do with suppliers is that we do not accept chemical material that is not in compliance with REACH and we urged all of them, either they complied or we terminated cooperation.... Bigger emphasis is given to the unit here, how much the environment is contaminated."*

Company C has only few environmental selection criteria in place (two out of 20 supplier evaluation criteria) and would also check on second-tier suppliers only in the case that a customer specifically asks for that information. Company C preferably chooses national suppliers because of a good cost-benefit ratio.

The purchasing manager of company D declares the following in regard to supplier selection criteria:

> *"We have a supplier' evaluation method where unfortunately our criteria until now have not been environmental factors because the parts we buy do not pollute the environment, there was no need. What I want to say ... three to four categories of material are dangerous: the hydraulic oil, for example. If somebody wants to have something environmental there is biodegradable oil that once thrown away is absorbed and does not burden the environment. For public works where we are forced to use the biodegradable oil, when asked for, our supplier BP created for us such oil."*

Company A communicates with its production plant in Turkey according to the same principles and standards as set by the company in Greece. There is dialogue and control with company visit in Greece, emails, sample forwarding, test results, etc. Involved are the departments of procurement and R&D, not production that follows the set rules.

Company E has integrated its suppliers of pesticides into its unified management system - against their initial resistance – which resulted in a decrease of the amount of pesticides sold and used. Company E demands from its suppliers the REACH

certifications and does also inspections at some of its suppliers. They also run laboratory tests on the supplies but otherwise environmental sensitivity is not a decisive factor for supplier selection. The general manager of company E gives an example why supplier control can be crucial:

> *"Four years ago, Delmonde that has a factory in Kenya, came close to destruction because they found that the pineapple contained a carcinogen. They had bought contaminated fertilizers cheaply from China, did not test for heavy metals, canned them and sent around the world. To collect all that back is a huge disaster."*

The logistics manager of company E further explains their policy toward suppliers:

> *"The truth is that for us a company with a management sensitive to environmental issues is an asset. But it is not a determining factor. It does not increase the level of a company. When we talk about green energy … every supplier has its own specifications."*

4.8.3 Other Stakeholders

Company A attempted to initiate with government agencies and business associations some green measures concerning green product design and waste management but no results have been achieved yet. As the director of marketing puts it:

> *It was 'lost in bureaucracy' and had no result."*

Considerations to initiate together with national competitors some voluntary agreements regarding the implementation of GSCM practices have failed due to the competitors' lack of interest.

Regarding cooperation with the government agencies company C has a mixed attitude:

> *"As far as the government agencies are concerned there is no good atmosphere of cooperation. There were times when they provided solutions but this always depends on the person who does the inspection."* (technical director, company c)

There is no environmental engagement by the company in the community except some sporadic seminars and participation in events. Company C is engaging itself in some community CSR actions but not related to the environment:

> *"We had thought of planting trees and cleaning, but it never happened because our free time is limited and the staff wants to spend weekends with their family." (technical director, company C)*

Company E on the other hand is active in collaborating with universities and research institutions. The company advises the ministry of agriculture. It invites schools to show their production methods and sells its technical and environmental know-how to other companies. It makes also proposals to local authorities as this latest one:

> *"The next offer I want to make is the residues of the factories to be able to be used in the irrigation systems with little or no burdening costs. Because the residues that come out from the biological treatment are in fact fertilizer. We have no heavy metals or chemicals. As soon as we neutralize the caustic soda that we use to peel a peach, with sulfuric acid, that we add to biological the ph stabilizes at 7, the water even though blurry is good and has fertilizer. Whereas when it gets into the river, vegetation increases, and these underwater plants consume oxygen and the fish are suffocating. But if the fertilizer is dropped into the field it would be a blessing. This is what I want now. We want to make a study so 2-3 plants are able to add our waters in a reservoir, where also clear water from the river goes, and from there our fields will be watered."(general manager, company E)*

4.8.4 Summary of Green Practices beyond Company Boundaries

The outcomes of the case studies in regard to the forth theme 'green practices beyond company boundaries' are summarized in table 4.11, 4.12 and 4.13.

Table 4.11 Green practices beyond company boundaries – downstream

GREEN PRACTICES BEYOND COMPANY BOUNDARIES	Company A	Company B	Company C	Company D	Company E
Downstream	big customers have strict requests				provides to clients suppliers' certifications
					customers make inspections; few environmental criteria

Table 4.12 Green practices beyond company boundaries – upstream

GREEN PRACTICES BEYOND COMPANY BOUNDARIES	Company A	Company B	Company C	Company D	Company E
Upstream	no supplier inspections; insists on appropriate certification (e.g. REACH standards)	cooperation with suppliers	supplier control only to the extent that they need to have the correct product certificates		Integrated pesticide suppliers into unified management system
		attempt to influence smaller size suppliers for increase of environmental measures	check on second tier suppliers only in the case of requirement by big customers		demand REACH certifications from suppliers
			preferred to have national suppliers because of good cost-benefit ratio, but must meet standards		do inspections at some suppliers
			few environmental supplier control criteria		laboratory test of supplies
					environmental sensitivity is not decisive factor for supplier selection

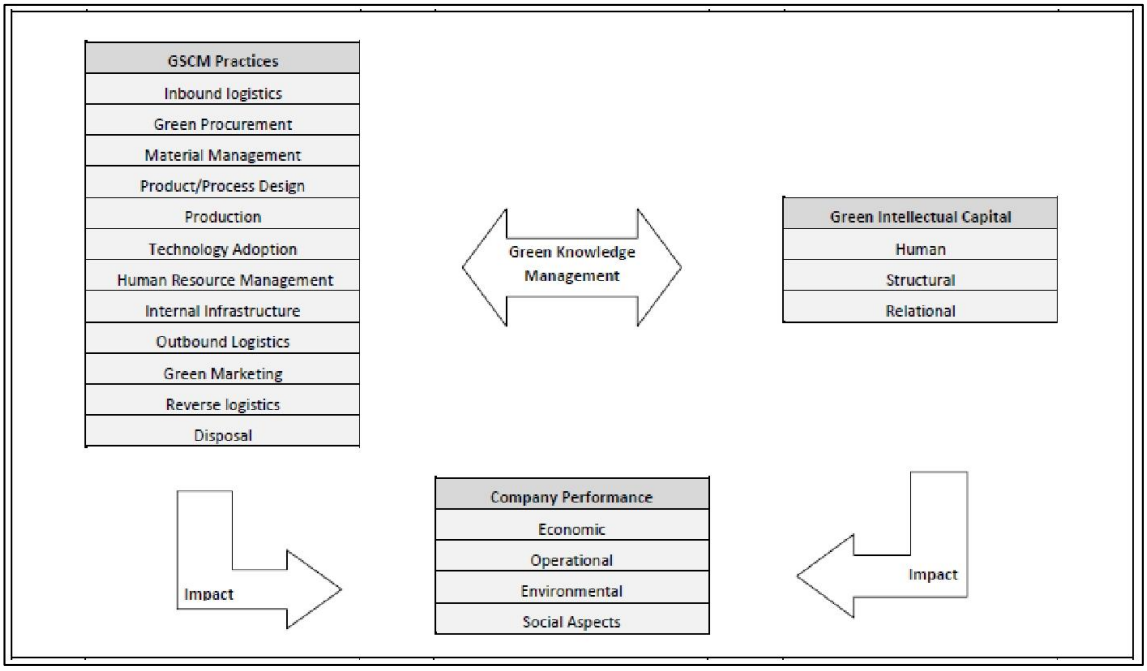
Table 4.13 Green practices beyond company boundaries – other stakeholders

GREEN PRACTICES BEYOND COMPANY BOUNDARIES	Company A	Company B	Company C	Company D	Company E
Other Stakeholders	initiatives with government agencies and chamber of commerce	combining environment friendly actions with social actions in community	CSR actions in community but not environment related		Disseminate/sell know-how to other companies
			Local authorities (prefecture) control regularly		Cooperate with universities for research
					make proposals to local authorities

4.9 Green Knowledge Management

In order to implement GSCM practices effectively the five companies need to use the green knowledge management that they possess, as depicted in figure 4.2. Green knowledge management can be found on three different levels, as described in section 2.2.6: 'green human intellectual capital', 'green structural intellectual capital' and 'green relational intellectual capital'.

Figure 4.2 Interactions of GSCM, green intellectual capital and company performance



4.9.1 Human Green Intellectual Capital

Human environmental intellectual capital refers to the ecology-concerned knowledge and skills of a company's employees relating to either operational capabilities or emotional commitment (Claver-Cortes, 2007).

Company A shows a philosophy of innovation that is embedded in top management and that is directing any efforts towards green practices. Responsible for applying for ISO 14001:2004 certification is the head of quality assurance. For implementation of ISO guidelines an external consultant has been hired lately. The main pooling of information concerning greening products in company A happens in the R&D department. The company does not present a written environmental mission paper. There is a general understanding of environmental issues among the employees of the company. Internal emails update the employees about latest measures implemented.

In company B top management shows a heightened awareness of corporate social responsibility and environmental concerns which triggers down to all employees. As the administrative manager describes: *"We do these things because we feel it is the right thing to do them."* Regular emails and announcements concerning multiple environmental topics and latest measures in the company are distributed to all employees. Nevertheless there is no written environmental mission statement present in the company. Motivation for environmental measures is restricted by the logic that first of all any measure has to make economic sense. As the production manager of company B puts it: *"First of all I think as a business man. If it does not save or make money, I hesitate to do it."*

Companies C, D and E have some staff training in environmental issues taking place throughout the year. In companies A and B top management is personally committed and serves as a leading example. Staff in company A listens to the requests and ideas of customers and accordingly engage the suppliers in discussion if and how this input can be realized in product development or process modification. In companies A and C there is constant marketing research taking place gathering from the market,

from target groups, focus groups, the demands of consumers, markets, customers. All these are all collected and sorted. Company D makes sure that knowledge gathered by staff during trips and fairs is recorded and disseminated within the company. In company E responsible for the management of these files of ISO, is a food technologist and she monitors the system. She is responsible also for quality control at the factory. There is also one agronomist who is responsible for the indicated crop management in production.

Important is the personal practical experience in how to handle and implement environmental issues, as the general manager of company E emphasis:

> *"In our cooperative organizations one should know the mentality of farmers. I survived in this area because I was a trade unionist. I was organizing protests, I was taking out tractors to the streets in 1983-4. I was president of trade groups, as an economist I was involved in programs and discussions, and when I came here I balanced the situation in the staff and they started working consciously. Of course I am between the board of directors and the employees and I take all the pressure ... also the staff is well educated on how to manage, I distribute the work. It is a model system in Greece, although not all apply it, with the result that you see wealthy directors and presidents and poor co-operatives and even poorer farmers. It is the sense of duty and offer. The other companies are not doing it for many reasons, but you see the difference both in the external and the internal market. I see what is important is the person. The person matters, it is not only to get paid. I give them the example that I do not take advantage of my position but they have to do what I want".*

In company D staff is encouraged to develop an innovative attitude and contribute new ideas.

4.9.2 Structural Green Intellectual Capital

According to Claver-Cortes (2007) structural environmental intellectual capital is formed by organisational capabilities developing the company's environmental management and technological capabilities concerning the development and implementation of environment friendly products and processes.

Company E undertook the training of its suppliers to ensure a good integration and smooth cooperation along the supply chain also in environmental matters.

"We did it because we knew that the market will ask for it to be more organized and have a central control, not to have the 50 dealers in the region apply a profit aiming policy." (general manager, company E)

The integrated production management system enables the organisation to control its supply chain and monitor parameters relevant to environmental performance. Protocols are accurately maintained. The general manager of company E further explains how the green structural intellectual capital is created and efficiently used:

"We know what farmland parcels each one has, there are files, a complete archive that is confirmed each year by the producer. Each producer receives instructions from us to spray his fields. We have agronomists and we issue instructions for plant protection (time, quantity, type of spray). The producer is informed because we also send them SMS messages to mobile phones and they go to the cooperative for the pesticide or to their own dealers who are informed by us to give them what the instructions say. In indicated crop management we keep economic data because we also sell pesticides in three stores. We see the turnover of shops in pesticides, fertilizers, we see that we have reduced sprays from four to two per month."

In company A relevant environmental knowledge is distributed from the R&D department through regular meetings to the other business departments. In company B the department of quality control takes the task to inform other parts of the company regarding environmental issues. Also in company C there are regular weekly management meetings where all necessary departments get involved when environmental issues are to be discussed, for example when discussing the development of a new more efficient oiling machine. As the commercial director characterizes the internal distribution of information and knowledge:

"In family businesses everybody knows everybody and the roles are not so defined. Everybody is everywhere. The information is concentrated in the marketing department, and every Monday there are meetings where all these matters are discussed, environmental, production and sales, everything is discussed every week in the management meetings."

Company C ensures good cooperation between departments and the proper recording and filing of relevant knowledge to be accessible when needed. The company

sets also benchmarks with the performance of foreign companies as a guideline for its own actions.

Company D on the other hand does not emphasize accurate record keeping of green knowledge but rather encourages personal initiative along the objectives envisioned for the company in the general strategic plan.

> *"There is nothing recorded, but generally the company pays great attention, and you will see it on non-pollution, waste disposal and recycling. That is, do such actions on our own initiative."* (purchasing manager, company D)

Nevertheless discussions in regular board meetings are recorded for further reference. Innovative ideas by staff are rewarded. Company D does not apply environmental criteria to its suppliers. But in annual records of supplier evaluation it is mentioned which ISOs they have for the records but it is not determining factor. Neither does the existence of an environmental management system play any role in supplier election. Internal audit regards procedures and finances.

Company A does not have a written strategy plan. Supplier evaluation is only in non-written form, no questionnaire. No written records in departments. There is some general knowledge and understanding of environmental issues but no central figure to know all the changes from old to new material with environmental friendly characteristics. The understanding is that it is better to have knowledge distributed among various departments where specific knowledge is needed. Specific material knowledge is also available from the R&D department. For the production of boards a big manufacturing part is done in Turkey according to the principles set by the company in Greece, same standards. Material improvement proposals are done by (big) suppliers in regular time intervals (emails, telephone, visits every 3 months). Proposals are checked and discussed by R&D and management (general, finance, etc.). Afterwards there comes the technical & marketing department and informs customers if they are interested or not. For example, clients of company A were interested in lead free only for the last 6 years although the company was able to deliver even before. They could not impose the new material on our clients but we always recommended.

4.9.3 Relational Green Intellectual Capital

The third dimension, relational environmental intellectual capital, refers to the company's relationships with its stakeholders and the market in which it operates, regarding environmental issues.

The five companies take a number of measures regarding the management of green knowledge in relation with their stakeholders and markets. Company A entertains a website giving some but very limited reference to its attitude regarding environmental responsibility. In spite of holding an ISO 14001:2004 certificate the company does not promote it prominently on its website but gives only some reference in its product catalogue. In product descriptions some reference is made to concordance with EC standards and to such regulations as disposing batteries in an appropriate way. Company A does not publish any environmental reporting. The company distributes a regular newsletter in which it also refers occasionally to environmental issues. In-house communication regarding environmental topics is done via emails, personal conversations on top, senior middle management level. The small size and the low hierarchy structure of the company allow short communication ways. While officially the responsibility for environmental issues lies in the hands of quality control, marketing plays a vital role in taking up new topics, while the R&D department is taking responsibility of technical exchange with suppliers. Big foreign suppliers make suggestions for the use of new material and product design which are taken up by the company if they seem to conform to other factors such as cost control and market demand. Supplier selection is not primarily defined by environmental criteria.

The vital influence on integrating green measures in the supply chain derives from foreign markets and clients. The exports to retail customers in North European countries, such as Sweden, with their high environmental standards put pressure on company A to change their products in order to conform to those standards. Big (potential) customers also conduct an environmental audit with company A as part of a general company audit and suggest or require the implementation of certain green practices along the supply chain. If such environmental audits are not satisfactory company A can lose the order to competitors. The company attempted to initiate with

government agencies and business associations some green measures concerning green product design and waste management but no results have been achieved yet. Considerations to initiate together with national competitors some voluntary agreements regarding the implementation of GSCM practices have failed due to their lack of interest. Company A goes for implementing all the necessary foreseen measures of ISO 14000. An EMS has still to be implemented, environmental measures and targets still to be defined and established. Lately, company A has decided to hire an external consultant to support the implementation process.

Company B does not have a written environmental statement. Although there are some thoughts to apply for ISO 14001 certification the process has not been started yet. There is no publishing of environmental reports. The company does not promote its environmental approaches and practices on its website. The reason for that omission is a general conviction that the company wants to avoid any impression of 'green washing'. As the marketing manager explains:

> *"I am cautious to promote our company as an environmental friendly one while we still have a number of environmental issues that would need improvement. We do not want to give an impression that we cannot uphold."*

While for example, some product design has been improved in terms of eliminating hazardous material, the company does not have the market power to tell their main suppliers to introduce green changes. On the other hand the company is big enough to achieve through the close cooperation of their R&D department with smaller suppliers environmental friendly changes in product design. The flow of green information inside company B is pooled in the marketing department that gathers throughout the year suggestions and useful comments from all parts of the supply chain to discuss them in an annual meeting in order to come up with new ideas and implications for strategic decision making. The company's products are price sensitive, and the product prize is one of the main factors determining product and process design within the company. Company B competes with many smaller manufacturers that put pressure on prices. As the marketing manager describes:

> *"The market for our products is not very sensitive for environmental needs, in particular the markets in the region of South East Europe."*

Co-operation with competitors for voluntary agreement regarding GSCM practices are not seen feasible at this moment. As the production manager of company B puts it:

> *"Many of our competitors tend to circumvent environmental regulations and do get through with this behaviour due to lack of enforcement."*

Company C does not have agreements or cooperation with competitors regarding environmental issues but the company cooperates on environmental issues with the inspectors from municipality, with the ISO inspector and with big clients.

Company E follows the market trends. The management gets together and discusses, and among the factories and in the canners union whenever they have new relevant information.

> *"We have contacts with MPs of European parliament, with other countries, with our customers abroad." (general manager, company E)*

Company E cooperates with universities and shares and sell its know-how, including environmental know-how to other plants. As a major initiative company E wants to help to have GAP (good agricultural practices) to be implemented also in Greece across the entire sector. As the general manager of company E describes:

> *"Now we apply to our own data a system which European chains of super markets determined and are now applied internationally as global GAP (GAP = good agricultural practices) and in Europe all follow the same protocols, which are records of actions that are done in each field. ... What matters a lot is to record the spraying because what you do the consumer will confront it. It is therefore really interesting to record the protection of plant and of course all others, management of waste, fertilizers, etc. This protocol is by the super markets. What do we ask as canners? ... We ask that a European protocol is done to cover them all, to have a certifying organisation, a body that certifies us. Still nothing has happened. We cannot agree all Europeans for a common protocol for all."*

4.9.4 Summary of Green Knowledge Management

The outcomes of the case studies in regard to the sixth thematic topic 'green knowledge management' are summarized in table 4.14, table 4.15 and able 4.16.

Table 4.14 Green Knowledge Management in case studies companies – human intellectual capital

GREEN KNOWLEDGE MANAGEMENT	Company A	Company B	Company C	Company D	Company E
Human Intellectual Capital	managers' values / example	managers' values / example	staff training in environmental issues	staff training in environmental issues	training of farmers
	spirit of innovation	internal emails	marketing research throughout the year to understand new trends	disseminating knowledge from trips, fairs, etc.	integrated production management system
	general familiarity with environmental issues	motivated employees		encouragement of staff to be innovative	own laboratory
	outsourcing implementation of EMS	no written environmental mission statement			
	internal emails, instruction for environmental behaviour	mentality: green only if it saves costs			
	no written environmental mission statement				
	not yet implementation of EMS				
	no central figure to know environmental issues				

Table 4.15 Green Knowledge Management in case studies companies – structural intellectual capital

GREEN KNOWLEDGE MANAGEMENT	Company A	Company B	Company C	Company D	Company E
Structural Intellectual Capital	no written strategy plan		regular weekly management meetings	specific objectives and actions for each section and each direction	training of dealers
	knowledge distributed among various departments	no department of environment but a department of quality control	Measurement system	nothing recorded, but generally actions on own initiative	Integrated production management system
			Involve all necessary departments	internal audit regards the procedures and finances	Protocols, recording
			everything is recorded and filed	reward for innoavtive ideas	integrated crop management we keep economic data because we also sell drugs in three stores.
			benchmarking with foreign companies	board meetings, record keeping to follow up	
			good cooperation between departments		

Table 4.16 Green Knowledge Management in case studies companies – relational intellectual capital

GREEN KNOWLEDGE MANAGEMENT	Company A	Company B	Company C	Company D	Company E
Relational Intellectual Capital	supplier evaluation only in non-written form, no questionnaire. No written records in departments		no agreements with competitors regarding environmental	working together with clients	Integration of dealers into system
		company does not apply environmental criteria to its suppliers	cooperation with inspectors from municipality		Cooperation with universities
	material improvement proposals are done by (big) suppliers in regular time intervals	annual meeting	Cooperation with ISO inspector		Send chemical engineer to other plants, sell and share know-how
	production of parts abroad is done according to the standards set by the company in Greece; dialogue & control (R&D dpt.)	newsletters	cooperation with big clients		GAP (good agricultural practices) to be implemented also here (Greek protocol 2.1 and 2.2)
	website	cooperation with suppliers			tracking system and laboratory

Table 4.16 : Green Knowledge Management in case studies companies – relational intellectual capital (cont'd)

GREEN KNOWLEDGE MANAGEMENT	Company A	Company B	Company C	Company D	Company E
Relational Intellectual Capital (cont'd)	newsletters	attempt to influence smaller size suppliers for increase of environmental measures			
	(environmental) audit by big customers	combining environment friendly actions with social actions in community			
	ISO 14001: 2004 certification	competitors not cooperative but price cutting			
	initiatives with government agencies and chamber of commerce	markets are price sensitive, not very environment aware			
	little information on website regarding green practices	big suppliers are not listening to suggestions			
	no green reporting	no written environmental statement			
	competitors not interested in cooperation in green issues	no green reporting			
	government agency and business association slow in supporting initiatives	no ISO 14001 certification			

4.10 Environmental Performance

The implementation of GSCM practices is supposed to have a beneficial effect on the environment as well as to improve community relations.

4.10.1 Positive Impact

All companies have achieved to reduce their energy consumption in their business processes. All companies practice waste selection, waste collection and recycling of waste. Companies A and B produce less waste. Company C through its green measures has achieved to use less material and less pollutants in its production processes. It also produces less waste. In packaging the company uses more environment friendly material. Waste water conductivity has been reduced even below its original value. The technical director of company C explains:

> *"The law says that the water that you throw out is not allowed to have more than 1000 conductivity. But we pump the water from the ground with a conductivity of 1100-1200 and add in the washing facilities here various biochemical materials. In the beginning it [the conductivity] may be around 80000 but we conduct different processes [to bring the conductivity down].*

Company C succeeded to reduce the loss of fresh water caused by leakages:

> *"We invested 70000 € to make this happen and we do not have any economic benefit from it as we take our water for free from the ground water but we did something good for the environment."*(technical director, company C)

Company E achieved a significant reduction of the use of pesticides, less water consumption and a better water quality. The company does its own composting of their organic waste to be used as fertilizer. It helps to preserve the existing fauna, as the general director describes:

> *"Us with all these systems we succeed in not using hard drugs, but to help the beneficial insects that help kill harmful ones and also spray with pesticides, which leave at harvest very few remnants. In the old times we used to spray a lot because we had another mentality."*

Also companies A and B make use of more environmental material, Company D reduced the use of pollutants.

4.10.2 Community Relations

Most of the companies engage in CSR actions for the community but not in particular for environmental causes. Companies A and E are making proposals for environmental improvements to the state authorities and other businesses in their sector as well as to associations. Company E is having good relationships with universities and research institutions and undertakes common research.

4.10.4 Summary of Environmental Performance

The outcomes of the case studies in regard to the seventh thematic topic 'environmental performance' are summarized in table 4.17 and 4.18.

Table 4.17 Environmental performance – positive impact

ENVIRONMENTAL PERFORMANCE	Company A	Company B	Company C	Company D	Company E
Positive impact	less waste		less pollutants used		less pesticides
	less electricity consumption				
	recycling of waste				
			less material used		
			Reduction of waste water conductivity		Better water quality
			less fresh water consumed		Less water consumption
	use of more environmental material	use of more environmental material	more environmental friendly packaging material		Composting of organic waste
					preserve fauna

Table 4.18 Environmental performance – community relations

ENVIRONMENTAL PERFORMANCE	Company A	Company B	Company C	Company D	Company E
Community Relations		combining CSR and environmental actions	good social responsibility actions but not in relation to green	leading example in regard to employee health and safety to industry sector (not green)	cooperation in research
					sharing of know-how
	initiatives with state agencies and chamber of commerce				proposals to state authorities

4.11 Value Creation

Besides the positive environmental effect GSCM actions can also add value to a company's economic performance, its operational performance and to its social aspects. All five companies state that they experience financial and non-financial benefits from the actions that they have implemented.

4.11.1 Economic

The use of more efficient machinery, as in the example of the new lubricating machine of company C, enables cost reduction for input of energy and raw material. Efficient redesign of processes saves cost for energy input, as in the example of company A that uses the extra heat stemming as a by-product from the running of a cooling machine to warm its factory premises,.

The sale of scrap material as in the example of company D gives the company a cost advantage. The reduction of waste by redirecting recycled material into the production process, as in the example of company A and B, reduces the cost for waste

disposal. The measures taken by the companies also ensure a competitive advantage in the attraction of new customers. As the plant manager of company D puts it:

> "*We have experienced this many times. We can visit a potential client several times, we can offer him a competitive price, he can inspect our product, but we finally convince him when he visits our factory. Because when he sees a factory that respects a couple of things, he gives you a different kind of trust."*

Company E achieves cost cutting through energy savings and reduced cost for pesticides. It sells its know-how to other organizations.

4.11.2 Operational

The environmental impact of the taken GSCM measures entail the need for less raw material, water and energy as well as the output of less solid and liquid waste. Better health and safety conditions for the workforce are consequences of green practices as well as better operational settings, such as a more efficient usage of storage capacity, as in the example of company C after the change from the bulkier Styrofoam packaging to slimmer and lighter cardboard packaging. During the visit of the premises of company C employees demonstrated the new organisation of machinery and the broader space gained through the change of package material to more comfortably handle goods. Also less space is needed for waste. This latter fact was impressively confirmed during a visit of company D where wooden pallets were stapled in an orderly way waiting to be picked up

Improved customer service by being able to respond or even anticipate the client's needs driven by environmental requirements, as in the example of company D fulfilling the public sector's requirement for biodegradable oil. The accumulation of specialized green intellectual capital enables a company also to faster innovate a product and take the first mover advantage in a market, as in the example of company B that developed in cooperation with other supply chain partners a new heat insulation product. The contact with the companies' suppliers becomes closer through sharing more information and ideas. The image of the companies in the community is also improved, as in the example of company B that gave outdated office equipment to institutions, such as schools and prisons in the community. Company E through its

integrated management system can make operations leaner in terms of timing, amount and type of pesticides as well as timing and amount of water for irrigation at the fields. All companies achieve more efficient processes that save time and resources.

4.11.3 Social

All companies achieve to create a healthier and safer working environment. They all establish a better relationship with their community. In the case of company E know-how is shared with other organisations and there is cooperation in research. The companies can improve their image and reputation.

4.11.4 Summary of value creation

The outcomes of the case studies in regard to the eighth theme 'value creation' are summarized in tables 4.19, 4.20, and 4.21.

Table 4.19 Value Creation - economic

VALUE CREATION	Company A	Company B	Company C	Company D	Company E
Economic	cutting costs, e.g. through energy efficiency	cutting operational costs, e.g. through energy efficiency	cost savings (less material used)	reduce operational cost	cutting costs (pesticides, energy)
	gaining new clients	securing market share	meet customer demand	create new customers	meet customer demand
	selling new innovative products	high quality products; product differentiation	marketing tool	differentiate product	high quality products
					selling expert know-how
	avoiding fines				

Table 4.20 Value Creation - operational

VALUE CREATION	Company A	Company B	Company C	Company D	Company E
Operational	higher efficiency, e.g. less used space		With less or lighter material more storage space is gained		Integrated production management system (time, amount and type of pesticides
	new innovative processes		Less space for waste is needed		better operational control through integrated system
	faster product innovation/development			faster product innovation/development	
		higher efficiency, e.g. less cleaning time for mixing machines	reduction of inefficient processes	higher efficiency, e.g. faster production process	
	closer relationship with clients				
	increased specific know-how				
	improved customer service				
	better health and safety of employees				

Table 4.21 Value Creation - social

VALUE CREATION	Company A	Company B	Company C	Company D	Company E
Social	establishing better community relationships				
	improved reputation				
			good relation with local authorities		share know-how, cooperate in research
	safer, healthier workplace				

4.12 Conclusions and Summary

In this chapter the findings of the five case studies have been presented. They were grouped into eight main thematic topics, each one with a variety of sub-topics. The main themes were: the environmental policy the companies pursue; the drivers for implementing GSCM measures; the barriers they face in the process of implementing those measures; the practices of GSCM they implement within company boundaries; the practices the companies implemented beyond their own boundaries along their supply chain and in the community; the way they manage green knowledge; the environmental performance that they achieve by implementing those GSCM measures; and the added value that they have achieved to create for their companies in regard to economic, operational and social performance.

CHAPTER 5: ANALYSIS AND DISCUSSION OF RESULTS

5.1 Introduction

In this chapter the research findings are analysed and discussed. The success factors for effective GSCM implementation are determined in the particular context of the situation in Greece. A framework is developed and compared with existing theory. The necessary shift of paradigm is elaborated and its requirements and conditions are examined. Finally the resulting advantages and opportunities for the future development and performance of the Greek manufacturing industry are described.

5.2 Reflections

Considering the overall impression that the Greek business community has been showing little interest and respect for the protection of the environment, as stated by Grant Thornton International Business Report ((IBR, 2011), the examples of GSCM measures in this present study may seem innovative for the country. Nevertheless, what seems to be needed is a shift of paradigm in this regard. Environmental strategy within the companies has not gained the priority it would deserve. Except when directly responding to environmental legislation and regulations, the common attitude appears to have the focus on cost saving measures which may have the welcomed side-effect to do something good for the natural environment at the same time (Baresel-Bofnger et al. 2011b). This situation becomes rather obvious by the sheer fact that most of the actions are not primarily categorized as 'environmental friendly' measures but as 'cost saving' measures. As the logistics manager of company A puts it:

> *"Look, the (concern about the) environment started from the moment when people understood that they have to find solutions with a lower price for energy, with the consequence of also less pollution of the environment. They see what they can save (as costs) and that saves also the natural environment from pollution. The one brings the other."*

The examples given by the companies in this research as green practices were mostly realized under the strategic focus of legal compliance, cutting costs, increasing efficiency or achieving new market shares through product innovation. A primary guideline for most green implementations in all five companies appears to be the economic accountability. As the production manager of company B says:

"First of all I think as a business man. If it does not save or make money, I hesitate to do it."

The concern for the natural environment is secondary. This confirms Kassolis (2007) observation that there is a lack of conceptual perception of environmental management practices in Greek companies.

5.2.1 Achievements

The case studies show that implementation of GSCM practices is a continuous process that shows a variety of positive financial and non-financial effects. The companies under investigation have succeeded through a variety of GSCM actions to create added value, as exemplified in the findings (chapter 4).

In many companies the definition and implementation of measure items and targets as well as appropriate measurement tools for GSCM and green intellectual capital could be better defined and established together with the implementation of an environmental management system in order to facilitate a more efficient management of green knowledge and enable a performance measurement regarding the impact of green practices along the supply chain. Some of the investigated companies have improved their environmental performance over the past through the implementation of preventive GSCM practices and have increased their environmental intellectual capital. Various measures have increased the efficiency of energy consumption, have reduced the scrap rate and increased recycling and the use of recycled material. To a certain extent products and processes have become more environment friendly.

5.2.2 Risks

In spite of the demonstrated examples of successful implementation of GSCM practices the is an apparent risk that the process of implementation is slowed down or at least not fostered due to overall adverse market conditions caused by the long lasting economic crisis that has hit Greece so hard. Companies might feel pressured to cut costs where they think it is the easiest. As the plant director of company D warns:

"My point is from my experience of Greek reality that what you cannot sell you must impose on the other one in order for him to do it. Because when my competitor wins, because these are all costs, I will be forced to stop this [green actions], too. Or when you get to the point where you have to survive and make cuts, you will start from those that are unnecessary expenses. You will ask if this is an unnecessary expense? But when you are forced to cut from somewhere else you will cut here and say: I will throw [my garbage] in the dump as my competitor does and I do not recycling."

This shows a number of risks for a successful environmental strategy in Greek companies. First, the low level of state control and law enforcement in Greece allows companies to largely ignore ecological topics and fosters a philosophy of avoidance or at the best of reactive compliance with what cannot be avoided finally. Second, this situation seems to create unfair competitive conditions for those who want to take environmental concerns more serious and want to integrate them in a more pro-active way into their overall business strategy. This attitude is based on the traditional viewpoint that dealing with environmental concerns means always costs and a trade-off in company performance (Walley and Whitehead, 1994). This way the climate of environmental insensitivity will be extended or intensified in Greece.

Another risk is to be seen in the lack of market demand for environment friendly products. It is not only the manufacturer but also the customer that shows only a minor interest in green products. As long as a more environment friendly product also means a higher price consumers might not decide for it. This is even more the case in a situation when a market is hit by an economic crisis.

5.2.3 Potentials

In order to be able to realize their potentials to successfully implement green supply chain measures the Greek manufacturing companies need to adopt a higher level of integrity and reliability in green matters. This means that they would need to overcome the still often prevailing attitude that GSCM could be improvised or be brought in on the sly so to speak. The plant production manager of company D compares the current attitude as following a fashion trend:

"Now with these issues of ecology there is this fashion in Greece, most consider this as fashion, as a trend and everyone is talking about green development, we talk all about the environment."

Such an approach can hardly be sustainable. In many companies there is still the traditional view as expressed by this manager:

"In any case, the first criterion is the costs and only thereafter any green topics. No company exists to practice social politics. That is the job of the state. Firms are there to make money. If they do not make money they would be charitable organizations."

A more promising approach will be to go away from copying trends that are not fully understood but develop a new appreciation of the value of preserving the environment and seek the available resources to use 'green' as an opportunity. Such different quality of strategic approach would be an attitude that focuses on the realization of green measures with the primary goal to achieve some benefit for the natural environment and to attempt to implement those measures within the settings of financial feasibility. To achieve such a leap in strategic mindset managers would have to reconsider their role in society and their corporate social responsibility.

In that sense, companies would implement environmental friendly products and processes to comply with state legislation or to satisfy demand for such products in the market but for a proactive approach as postulated by Aragón-Correa and Sharma (2003) this is not sufficient. Nevertheless, there are some few examples where personal values of management translate into actions that go beyond the only required measures and are not primarily money-oriented, such as the mentioned attempt by company C to reduce the quantity of fresh water, which it gets free of charge, by looking for leaks in the pipe system.

The entrepreneurial potential is available in Greece but it needs to be supported by the Greek state.

"There are currently in Greece remarkable entrepreneurs…The state is doing what?... The biggest problem of the Greek industry is currently the Greek state. The state … tries to promote certain actions towards companies and firms … but because it has no believe in them itself and they were imposed on it from

somewhere else, it can create a legal framework but does not only not give any support in that direction but even puts obstacles in the way."
(plant manager, company D).

The state could help set the appropriate framework but in spite of the existence of relevant environmental legislation and regulations all interviewed companies express dissatisfaction with the lack of state support and incentives for green actions and lack of state control and enforcement of implementation of environmental regulations.

An incentive could be the introduction of environmental classification labels for more products, similar to the ones already existing for refrigerators, dishwashers and washing machines, giving classifying scores from A to F for energy efficiency and environmental friendliness. As suggested by the purchasing manager of company D:

"Here we sell what the other one needs, green or not. To say it in different words, from the moment on that the adhesive labels A,B,C,D were put on the washing machines, an uneducated housewife who was looking at how much clothes would fit in the machine and if she liked the colour, is now looking at the (ecology) label. Therefore demand has gone this way, here and everywhere."

In terms of management of green knowledge companies could improve their existing mechanisms in several ways. An emphasis on a higher quantity and higher frequency in disclosure of GSCM practices on the company website and in newsletters would have a positive effect on the transparency of business actions of the companies and would increase trust and support from other stakeholders. According to Bowen (2000) the degree of a company's environmental visibility can be seen as often positively related to the amount of pressure they face to adopt green practices. Besides legislation, such pressure could be put on by a firm's competitors, as Zhu et al. (2005) argue, customers according to Green et al. (1996), or other stakeholders. In the present case studies the pressure from competitors and the public may still be not strong enough. The presence of an environmental mission statement and a written environmental strategy would strengthen the companies' focus on environmental measures. The mechanism of company B to primarily discuss environmental initiatives once a year under the guidance of the marketing department appears rather restrictive for a process that should be a continuous one. In company A the eminent role of the R&D department regarding the management of green knowledge with suppliers neglects the potential of other departments such as procurement and logistics to

contribute to that co-operation. Together they could create a supplier evaluation process in regard to ecological issues.

5.2.4 National Context

In Greece many companies have the impression that they would need to follow what they see as a new market trend without really understanding the theoretical background and the practical implications.

> *"What I was saying is that in Greece the biggest problem we have right now is that we do not make things because they will serve our needs. We always run to adopt things that others have created elsewhere, and of which we often do not know the reason. There was the phases of adoption of ISOs, then it was the phases of logistics, and now we are all talking about green development for various things, but nobody is aware of why we like it and where exactly it can help us. ... Most of the times we are running behind the facts and adopt practices in which we do not really believe because we do not understand them." (general manager, company D)*

The fact that Greece is a country with a growing environmental sensitivity means that the philosophy of environmental protection must be introduced in a thorough way involving all parts of society and all relevant stakeholders in the various fields. Only if the concept is truly understood there is a chance for sustainable success of adopting the appropriate measures in all parts of society, including business.

On the other hand it is true that in times of globalisation no business stands isolated any more within its national context. The ability of businesses to adopt management strategies that allow them to be part of international business networks has become compulsory. This holds true also for being integrated as a Greek manufacturer in global supply chains.

One big obstacle in Greece is the state that not only does not foster the implementation of GSCM but often hinders it with its lack of initiative:

> *"Where is the necessary infrastructure? Where are the wastewater treatment facilities? Let us see Switzerland which is a classic situation based on SMEs. Thousands of small factories but they have their infrastructure, pipelines for waste water, the processing facilities of waste water every 2-3 km where the villages are, and in Bern and Germany the same thing. Here the state cannot tell you that we will make green development and request action. Moreover it does*

not make any control anywhere, with the result that even if someone is an entrepreneur behaving correctly, if he sees another one who does nothing just to reduce his costs, he will think that he is a fool. The state does not help. Is it really possible that here we have an industrial zone and not have a central biological purification system? It is possible to be in an industrial zone and not have a standard power supply?" (plant manager, company D)

5.2.5 Critical Success Factors

From the five case studies a number of critical success factors have been derived that appear essential for an efficient implementation of GSCM in Greek manufacturing companies. These success factors are summarized in table 5.1. These success factors are seen in relation to the different thematic topics that have been determined earlier: Environmental policy; Drivers; Barriers; Practices within company; Practices beyond company boundaries; Green knowledge management; Environmental performance; Value creation.

Table 5.1 Critical success factors for effective GSCM implementation in Greek manufacturing sector

SUCCESS FACTORS	Theme 1: Environmental Policy	Theme 2: Drivers	Theme 3: Barriers	Theme 4: Practices Within Company	Theme 5: Practices Beyond Company Boundaries	Theme 6: Green Knowledge Management	Theme 7: Environmental Performance	Theme 8: Value Creation
Effect on environmental, economic, operational and social performance	Green goals must be part of business strategy	Full management backup/ leader's ethical values	No formal appearance of green strategic goals	Selective waste collection	Cooperation with customers/ Control by customers	Top management green values & conduct	Improvement of working environment and life quality	Improvement of safety and health
	Mission statement	Green culture in organisation	No green reporting	Recycling programmes	Cooperation with suppliers/ Control of suppliers (also 2nd tier)	Cooperation of all departments	Less waste	Reduction of costs
	Green goals must be fully and formally communicated inside and outside company	Drive for innovation & quality	Green concern have inferior priority to other strategic goals	Implementation of and compliance with ISO 14000	Cooperation with state authorities	Dissemination of green knowledge throughout all levels	Less consumption of resources	Financial profit
	Formal reporting	Desire to save costs	Concern about high costs	Use of new more efficient and environmental friendly machines and production methods	Cooperation with business community	Encouragement for initiative		Better reputation

Table 5.1 (cont'd) Critical success factors for efficient GSCM implementation in Greek manufacturing sector

	ISO 14000	Legislation & control	Resistance in mentality	Reduce water and energy consumption	Cooperation with research institutions	External advisors		Better operational efficiency
	Expressive part of supplier selection	Customer demands & controls	Market/customer insensivity	Use of new more environmental friendly materials	Green actions for local community	Strong R&D department		New clients
	All departments involved	Competitive pressure	Low level of state control	Implement integral measurement & control system		Exchange of know-how with competitors, suppliers, customer, business & research community		Better product quality
		Supplier collaboration	Lack of state support	Measure green parameters		Training of staff and partners		
		Attract new international clients	Lack of cooperation	Train staff		Integrated measurement system		
			Economic crisis			Record keeping		
						Internal audits		
						Benchmarking		
						Supplier evaluation		
						Integration of suppliers		
						Green reporting		

5.2.5.1 Environmental Policy

Regarding the development of a strong and sustainable environmental business strategy it is first of all essential to formulate and integrate green principles and goals into the company's general business strategy. It needs to be ensured that those environmental goals are given equal importance in the strategy as other strategic goals, such as economic ones. Important is that these green goals are expressed in a formally written way.

The commitment to respect the environment in all business operations must also be expressed in the company's mission statement in order to convey this message as an integral part of business philosophy inside and outside the company.

Once the goals have been formulated the company needs to make sure that all levels within the organisation get familiar with them in theory and practice. The environmental principles must be communicated by all available channels. The same holds true for communicating them to the stakeholders outside of the company. All supply chain partners need to be made aware of them as well as all other stakeholders, including the community in which the company is located.

It is noteworthy that 'green-washing', which is often witnessed in the markets as an expression of companies' only superficial engaging in environmental issues without serious intentions other than marketing, is generally not practiced by the interviewed companies (Baresel-Bofinger et al., 2011c). The companies rather neglect to adequately translate their actions with an environmental benefit for marketing purpose. As the marketing manager of company B explains:

> *"I am cautious to promote our company as an environmental friendly one while we still have a number of environmental issues that would need improvement. We do not want to give an impression that we cannot uphold."*

Another important element is formal environmental reporting. These reports can be addressed towards supply chain and other business partners, state authorities, and the

public. This reporting mechanism ensures constant monitoring for the company itself as well as transparency towards business partners and the public.

5.2.5.2 Drivers

As far as drivers for GSCM implementation are concerned the full backup of top management is needed. The leadership of the company needs to have a strong belief in the ethical values necessary for implementing GSCM practices. Top management will have to act as leading example for the company.

Within the company an environmental culture needs to be created and fostered. This can be done in many ways, including staff encouragement and reward of personal initiatives for green actions.

In order to achieve environmental improvements in product development and business processes the principles of high quality assurance and innovation need to become integral parts of the business culture in a company, as well. These principles go hand-in-hand with the taking into account the environmental aspect. One principle can be seen as complementary to the other.

Additionally to the aforementioned principles the economic aspect is very important as well to make GSCM implementation a feasible and sustainable endeavour. As it is understood that the very reason for existence of any business is to be profitable the desire to save cost can be a very good motivator for seeking environmental friendly solutions that have this very effect. Having this in mind the time perspective for the economic aspect does not and should not be short-term but rather mid to long-term. Many GSCM practices and also investments in green measures, such as buying a new more efficient and less energy consuming machine, can pay off in the longer run.

Compliance with latest EU and national laws and regulations in regard to environmental protection is a must for a company. Rather than adopting a reactive approach a company is advised to take a proactive attitude in this matter. Foreseeing

future legal developments and preparing the company on time can bring a competitive advantage.

To be close to ones customers and maintain a lively dialogue regarding their needs and desires in ecological concerns, such as desired product features, as well as getting feedback from them regarding current products and processes, can result for the company in capturing new ideas for product development and process improvement. New ideas can also be developed in cooperation with customers. Company audits by important clients can also be a good means for the company to ensure proper follow up of its own environmental goals.

The pressure felt by competitors can be a good incentive for a company to look for innovative ways to maintain a high environmental standard. Competitors can also be a source to get new ideas that might be even realised together with the competitors in some cases to a common benefit. Coopetition can work well. Also volunteer actions together with competitors can be done in order to set higher environmental standards for the entire industry.

Potential cooperation with competitors for green issues is compromised by a general attitude of *"survival on your own"* as put in words by one of the interviewed managers (Baresel-Bofinger et al., 2011c). On the other hand all five companies agree that competition does help push green development by forcing a company to catch up with another company's advanced green technology in order not to lose market share, as also argued by Zhu et al. (2005). But the companies refer mainly to foreign competitors. According to Bowen (2000) the degree of a company's environmental visibility can be seen as often positively related to the amount of pressure they face to adopt green practices. In the present case studies the pressure from national competitors and the public appears to be still rather weak. Civil pressure groups do not play any important role.

While suppliers usually are not considered a motivation factor by themselves, their successful integration into a firm's supply chain management can result in the company's improved environmental performance, as argued by Vachon and Klassen

(2006). Company B's good cooperation with its suppliers leads to green product design by eliminating hazardous material. This exemplifies the argument by Cheng at al. (2008) that a trustful relationship is necessary for green knowledge sharing. Nevertheless, in the case of company B the limitation can be made that a firm's market power has to be adequately strong in order to make also big suppliers participate in the process (Baresel-Bofinger et al., 2011b). A good collaboration with its suppliers is crucial for a company to achieve a good implementation of GSCM practices. Suppliers can be a source of new ideas how to improve products and processes. The close exchange of information can help to ensure compatibility in terms of environmental issues and can also help to implement green measures beyond the borders of one's own company. In that sense also control of suppliers through formal reports and company visits can help to ensure proper implementation of agreed goals and the desired environmental standard along the entire supply chain.

International clients are important for companies, in particular when located in small national markets such as Greece. The experience from the case studies show that international clients are more easily attracted when the company displays an understanding and adherence to high environmental standards. International clients can also bring many times useful knowledge to the company regarding implementation and improvement of GSCM practices.

5.2.5.3 Barriers

When a company has none or only a rather casually expressed environmental agenda it can be an impediment for implementing GSCM measures. The goals will not be able to serve as a strong base for the actions required and might get out of attention when other things seem to become more important. In the absence of a formal appearance of the environmental strategy it might be difficult to give to the green principles and goals the impotence that the company intends to do.

The lack of green reporting does not provide the monitoring and transparency that a company is looking for when it decides to become greener in its actions. An important means of control and communication will be lost.

If a company thinks that environmental principles and goals do not deserve the same priority as other, for example economic, goals it endangers the success of GSCM as in a matter of conflicting interests the environmental aspect will most probably neglected.

The general fear that the taking into account environmental concerns in business operations leads necessarily to an increase of costs is an important impediment to implementing GSCM practices in a company. What needs to be done is to do a careful assessment of all the relevant factors in the perspective of the appropriate time horizon in order to come to right conclusion. Financial and non-financial added value needs to be considered.

Not to be underestimated is the factor of human resistance to change. People in the company might resist the implementation of environmental measures due to ignorance or disapproval or due to the fact that it may have personal consequences or any other kind of reasons. Important to understand is that the support of the company's stakeholders needs to be gained in order to ensure successful implementation of GSCM measures. Education and training as well as incentives and reward for active engagement can be helpful means to convince people.

The often observed or declared insensitivity or disinterest of customers in regard to environmental concerns, either in product features or the underlying business processes, many times turns out to be a serious impediment for the introduction of GSCM practices n a company. The argument goes that if in doubt the client always goes for the price criterion. The challenge for the company lies in the question if 'green' implementation necessarily needs to be reflected in a higher price or in which way the product can be made attractive to the client. Internally a company might be able to balance the increased product cost, for example through saved costs from energy savings or less need for consumables or raw material. Externally, education of the market, supported by other players in the industry or the civil society or the state might increase the acceptance rate of customers.

The low level of state control regarding the implementation of environmental laws and regulations in business operations has often the consequence that enterprises neglect compliance and take the comparatively low risk of getting caught and fined. This can also lead to a distortion of competition unfair for those who do comply.

5.2.5.4 Practices within Company

The relevant success factors can be seen in table 5.1.

Through the reduction of water and energy consumption in its business operations the company can achieve positive environmental and economic effects.

The appropriate training of employees is an essential part of the implementation of GSCM practices and leads to the provision of the necessary know-how and motivation. Besides environmental also operational benefits are achieved. This is in accordance with what has been also suggested in literature (Jabbour and de Sousa Jabbour, 2016).

The implementation of a measurement system and the definition of the appropriate parameters are compulsory elements of an effective implementation of GSCM. The comparison to preset benchmarks can lead to a steady improvement of reduction of consumption of resources and generation of waste. Environmental, operational and economic benefits are achieved.

5.2.5.5 Practices beyond Company Boundaries

The relevant success factors can be seen in table 5.1.

The close cooperation with 1st and 2nd tier suppliers and with the company's clients leads to an exchange of ideas and know-how and facilitates the adoption of GSCM practices. The results are improved products and processes that cause fewer burdens for the environment and add also operational and economic value to the company.

Closer cooperation with research institutions results in better know-how exchange and means an improved company performance in the social, environmental, operational and economic dimension.

5.2.5.6 Green Knowledge Management

The relevant success factors can be seen in table 5.1.

The creation of a trustful relationship is necessary for green knowledge sharing (Cheng et al., 2008). In the present case study of company B this statement holds true with the limitation that a firm's market power has to be adequately big to make big suppliers participate in the process. Where this network of knowledge exchange can be established, there the co-operation regarding green issues with suppliers and clients leads in the investigated case studies to an increase of environmental intellectual capital, as described by Baresel-Bofinger et al. (2011a).

In order to convince companies that proactive engagement in green actions could bear a variety of benefits for them it would also be necessary to establish a clear link between green measures and related financial and non-financial performance measures. As long as the tools, measure items and targets for a full cost-benefit analysis related to a green action are not implemented companies will not easily understand the added value for their products and shy away from a green agenda fearing financial disadvantages. In the interviews of the various case studies it became clear that managers see the financial and non-financial benefits of their actions but would not easily recognize them as results from GSCM practices (Baresel-Bofinger et al., 2011c). They would rather categorize the action as a cost cutting measure with a primarily financial goal. The re-categorisation of the same action under a different strategic goal, namely the protection of the natural environment, would allow redefining the relation of cause and effect and would help to enable the company to create and use purposefully a pool of specific green knowledge.

5.2.5.7 Environmental Performance

The relevant success factors can be seen in table 5.1.

As Vachon and Klassen (2006) describe in their research, the successful integration of a firm's suppliers into its supply chain management can result in the company's improved environmental performance. This is what has been achieved by some of the companies in the investigated case studies.

5.2.5.8 Value Creation

The relevant success factors can be seen in table 5.1.

The various GSCM practices implemented by the companies under study and the accumulation of environmental intellectual capital have an impact on the companies' organisational performance and their value. End-of-pipe green measures that control environmental impact but do not remove it create costs for the companies but do not generate value (Claver et al., 2007). On the other hand, also these measures can help generate business as in the example of company A attracting a major foreign client due to the fulfillment of the environmental audit. Company B realizes cost savings through GSCM measures that reduce energy consumption. Operational performance of company B is increased through the minimization of scrap rate and the improved utilisation of machinery (Baresel-Bofnger et al., 2011b). Company A can promote its product of greener design to new clients and markets.

In terms of social aspects such as employee motivation, less turnover, attracting better qualified personnel the GSCM measures implemented by the investigated companies do not show any effect. On the other hand improvements in employees' health and safety have been realized through GSCM practices, as described by Baresel-Bofinger et al. (2011b).

5.3 New Integrative Framework

From the discussion above some important determinants for effective GSCM implementation can be derived and put into a more integrative framework than the existing ones. The comparison with existing frameworks and the effect on the various dimensions of company performance are depicted in table 5.2.

5.3.1 Shift of Paradigm

The present research shows that environmental goals still play largely a subordinate role in the general business strategy of Greek manufacturing companies. Most often priority is given to the overruling economic principle of profit-making, followed and fostered by strategic goals of sustaining 'innovation' and 'quality'. Environmental values can be integrated as long as they succumb to the economic prevalence and mostly under the condition that the market appreciates such a focus. This general principle is only broken scarcely if top management shows a personal motivation due to individual ethical standards.

Higher costs due to environmental measures are generally considered as non-acceptable unless these measures are rewarded in the market with a higher product price. In the examined Greek companies the attitude is still omnipresent that the market is still insensitive to green processes and product features.

Unless there is a major change of market attitude and apart from the few cases where top management shows a personal motivation to implement environmental values in the business strategy the required change would be a major shift of paradigm across the Greek manufacturing industry. While the principles of 'quality improvement' and 'innovation' are well accepted in companies' philosophy the idea of environmental protection appears still to be something that is not fully understood in its importance, all its dimensions and consequences. From the currently prevailing attitude of **'Green as a nice side effect of quality improvement and process and product innovation'** towards a major strategic focus on **'Improving environmental performance under consideration of economic feasibility'**. Economic feasibility here needs to be

Table 5.2 Framework comparison

DETERMINANTS FOR EFFECTIVE GSCM IMPLEMENTATION		Integrative framework			
		Environmental value	Economic value	Operational value	Social value
Resource-based view	accumulation of required resources and capabilities	yes	mid -long term	yes	n/a
	investments in conventional green competencies related to green product and manufacturing technologies	yes	mid -long term	yes	n/a
	investments in employee skills	yes	mid -long term	yes	yes
	investments in organizational competencies, deriving from such areas as R&D and product design,finance and accounting, among others	yes	mid -long term	yes	n/a
	investments in formal management systems and procedures	yes	yes	yes	n/a
	efforts to explicitly include environmental issues in the corporate strategic planning process	yes	mid -long term	yes	yes
Competence-based view	development of required competences to use available resources and capabilities	yes	yes	yes	yes
	green competences	yes	mid -long term	yes	n/a
	market orientation	yes	yes	yes	n/a
	partner network	yes	yes	yes	yes
Relational view of collaborative advantage	share know-how with alliance partners	yes	mid -long term	yes	yes
	exchange green knowledge with supply chain partners	yes	mid -long term	yes	yes
	seek collaborative advantage	yes	yes	yes	yes
	build and leverage collaborative partnership with suppliers	yes	yes	yes	yes
	critical supplier selection	yes	yes	yes	n/a
	develop relational capability	yes	mid -long term	yes	yes
Stakeholder approach	take into account all relevant stakeholders of the company	yes	mid -long term	yes	yes
	build and maintain good relationships with stakeholders	yes	mid -long term	yes	yes
	actively manage stakeholders interests	yes	mid -long term	yes	yes
	satisfy customer	yes	yes	yes	yes
	comply with law	yes	yes	mid -long term	yes
	good corporate citizenship	yes	n/a	mid -long term	yes
	care for employees	yes	mid -long term	yes	yes
	cooperation with supply chain partners	yes	mid -long term	yes	yes

understood not as profit maximisation but as economic capability to enable value creation on a variety of levels including environmental protection. In this context the principle of reinvesting costs saved by green measures back into Green supply chain management measures should be largely supported. Also the appropriate time perspective has to be taken into consideration. A company would allow for short-term reduction of profit for a more sustainable company value in the mid-term or long-term perspective.

The development of an increasing environmental consciousness to be implemented in supply chain management practices could look like the following levels:

1st stage:	no environmental consciousness/concern
2nd stage:	some environmental concern/sensitivity; major driver is legal compliance
3rd stage:	heightened environmental concern; major driver is to create cost savings
4th stage:	high environmental concern; 'green' as a tool to create profit
5th stage:	integrated approach; 'green' as an integral part of business strategy; aim to create multidimensional value for the company; do good for society

Consequently, the paradigm to be gradually adopted by the companies would be as follows:

1) Focusing on legal compliance and cost reduction with potential positive side effects on environmental performance (current paradigm)

➡ 2) Centering attention on improving environmental performance under consideration of economic feasibility

➡ 3) Consequent integration of green issues in the business strategy (on equal level with other strategic goals)

➡ 4) Consequent investigation in all fields and levels of business operations where implementation of green measures can create operational and economic profit and/or social and environmental profit (GSCM implementation as a tool to create multidimensional value for the company)

5.3.2 Requirements and Conditions

In order to facilitate such a shift of paradigm companies need to be convinced that GSCM measures can indeed lead to increased company value in the future. Longitudinal studies will need to be conducted to show more evidence also for the Greek context. One important precondition for successful implementation of GSCM is a more systematic approach than currently practiced in Greece. Theoretical and practical guidance and transfer of know-how would be useful. This learning could happen in cooperation with experienced supply chain partners or also in cooperation with consultants and academia. Here an assessment tool would be useful for companies entailing the key success factors for evaluating the possibilities of success. Staring from a primarily qualitative assessment tool it could be supplemented with quantitative parameters and benchmarks.

A compulsory support for achieving such a paradigm shift and for a systematic and efficient implementation of GSCM measures are the creation and maintenance of a written formal environmental strategy and action plan as well as obligatory green reporting. Adequate green performance measurement tools need to be implemented in order to be able to provide the necessary numbers for the evaluation of economic sustainability of GSCM. The use of technological innovations needs to be encouraged for the support of environmental measures within and beyond the company's boundaries.

5.3.4 Existing Focus versus New Focus

A comparison of the existing focus prevailing in the Greek manufacturing sector regarding the implementation of GSCM with the vision of how a new focus could be imagined is depicted in table 5.3

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Table 5.3 Existing focus vs. new focus

Factor	Existing Focus	New Focus
Strategic goal	Profit maximisation vs. Green measures	Total value creation taking into account green measures
Role of green strategy	Not part or subordinate to general business strategy	Equal part of general business strategy
Use of cost saving through green measures	To improve company's economic performance	To enable further green measures of company
Role of innovation	Enabler of green measures	Result of green measures
Knowledge sharing	Enabler of supply chain	Enabler of green supply chain
Resilience	Environmental risks underestimated	Environmental risks fully accounted for

5.3.5 Advantages and Opportunities

This new approach of value creation results in a variety of advantages and opportunities for the Greek manufacturing companies and the entire industry, as well as for society as a whole. A broader range of value creation is feasible and targeted. A healthier and safer work environment is created. A better relation with the community is achieved. Overall, a more ethical approach is adopted. New market opportunities are discovered. The company's competitive advantage is strengthened. Companies gain a higher sustainability and level of resilience.

5.4 Future Industry Performance

The Greek manufacturing sector will face in the future a (national and international) market that will be increasingly receptive for green ideas and will demand from manufacturers compliance with environmental regulations. The market will expect manufacturers to be proactive and transparent in regard to environmental practices. This is a phenomenon that can be seen worldwide. At the same time Greek manufacturers

will face increasing regulative pressure and increased control mechanisms. Greece will be forced by its European partners to intensify the pressure.

Competitive pressure will be increasing on Greek producers. This pressure will come both from international competitors and national competitors. International competitors will set high standards in environmental compliance while their Greek counterparts will need to push themselves to a higher level in order to be able to remain eligible partners for global supply chains. Technology will further advance and will provide new opportunities for Greek manufacturers to use more environment friendly machines for better prices.

As envisioned by the purchasing manager of company B:

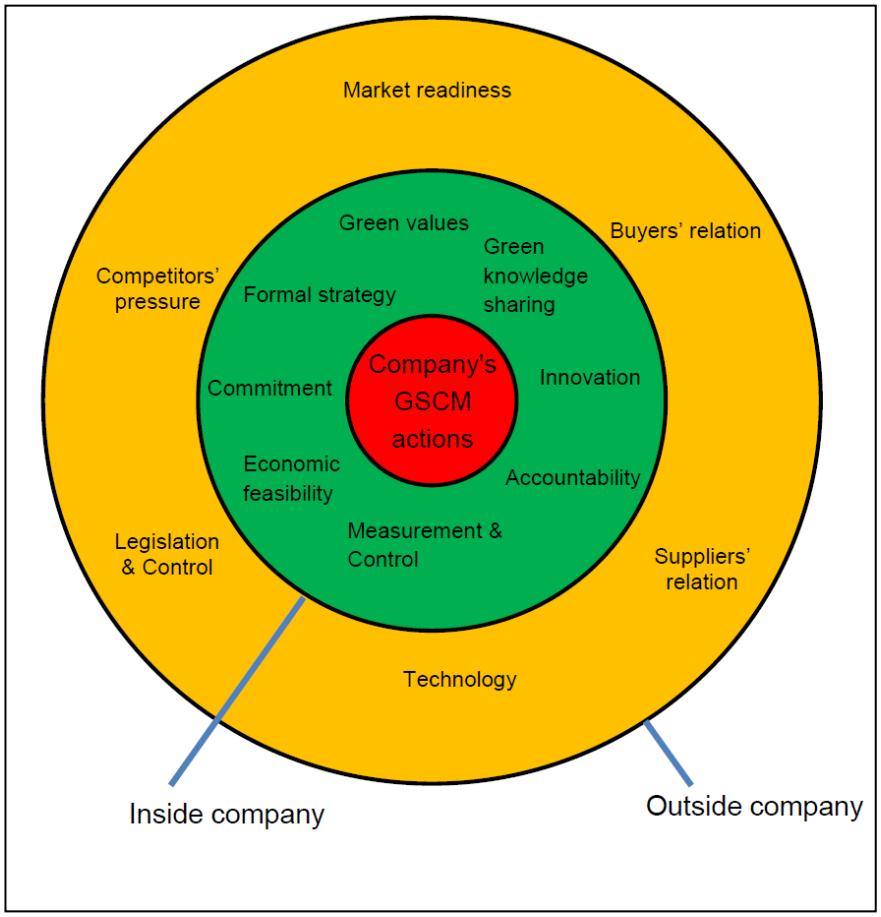
> *"The state will get serious, and will start doing controls, but also customers will ask for it and foreign customers and markets that we would like to go will be more sensitive. So if you want to grow strategically, then you must have the skills and be ready. If you wait, you may lose the market. Someone might fight you by saying that you do not protect the environment; our agent will tell us that they fight him, so we must be ready and take that as an advantage."*

The Greek manufacturers will not be able to escape the aforementioned pressures and will feel forced to adopt a more proactive attitude towards GSCM for the reasons mentioned above. They will also grow a better understanding of the various ways that GSCM can create added value to their companies. The successful implementation of effective GSCM measures will make the Greek manufacturer sector more sustainable in the long run. In all the investigated case studies the managers confirmed that they have plans for greener products in the pipeline but were still unsure about the right moment to produce and present them to the market. This is independent from the particular product but ranges from fruit canning to construction of elevator lift systems.

The Greek manufacturing industry is confronted with an economic crisis in their country that has been going on for many years now. National demand has been drastically reduced and exports are shrinking. In order to open for themselves a

perspective for growth and to maintain sustainable partnerships within global supply chains Greek manufacturers will have to see GSCM as an opportunity. The crucial factor for success or failure though will be to choose the appropriate systematic approach for implementation. Each company has to deal with a multitude of factors in this effort as depicted in figure 5.1. Besides the responsibility of each single company the idea of common actions within the industry should be seriously examined.

Figure 5.1 Factors for GSCM implementation



5.5 Conclusions and Summary

In this chapter the findings from the case studies were analysed and put into relation to the insights gained from the literature review. The success factors for the effective implementation of GSCM measures in the Greek manufacturing companies were examined and discussed. A comparison between the current condition and the

future possibilities for the Greek manufacturing industry made. The existing theoretical frameworks capture each one some part of the necessary conditions that need to be created. A more integrative approach would allow a more holistic perspective. Most important is to create a shift of paradigm for the Greek manufacturing industry. From the currently prevailing attitude of **'Green as a nice side effect of quality improvement and process and product innovation'** towards a major strategic focus on **'Improving environmental performance under consideration of economic feasibility'**.

CHAPTER 6: CONCLUSIONS

6.1 Introduction

In this chapter the overall conclusions of the research are drawn. The main findings are once more described. The contribution of the research to theory and practice are summarized as well as implications for policy and practice indicated. Limitations of the research are explained and suggestions for further research are given. The chapter ends with a personal note of the author.

6.2 Research Overview

The objective of this study was to examine what are the common practices of green supply chain management in manufacturing companies in Greece and how green management practices can be effectively implemented along their supply chain in order to achieve a better environmental, economic, operational and social performance of their company.

The research started with a literature review to gain the necessary background understanding of the various dimensions and relevant aspects of the topic. The research methodology was then explained in detail giving a justification for the chosen exploratory qualitative approach through multiple in-depth case study. Following the findings of the case studies were described in detail and then discussed and analyzed. The own findings were compared to existing frameworks from literature. Finally, conclusions were drawn.

6.3 Main Findings

This research examined how Greek manufacturers facilitate the implementation of green supply chain management practices inside and beyond the boundaries of their company. In five in-depth case studies opportunities and obstacles for the realization of green actions along the supply chain were scrutinized. The question was analyzed to what extent GSCM can be regarded as an opportunity to create additional company value. The results of the research show that these companies, although they are

operating in an environment that can be characterized as not very supportive for the implementation of a green company strategy, have succeeded in realizing a good number of actions with obvious beneficial effects on the natural environment.

Nevertheless it has become obvious that the majority of these actions were not undertaken with the primary strategic goal to protect the environment but with other motives, such as reduction of costs, increase of efficiency or new product development. The benefits for the natural environment could be rather characterized as welcome side effects. Only when responding to environmental legislation and regulations, green measures are in direct focus. Also the demands from major customers are a potent enabler of GSCM practices. The personal values of management on occasion spark green actions that go beyond the mere requirements.

Generally, the findings indicate that implementation of GSCM often lacks the necessary systematic approach, focus and vigour. There is no clear priority for a green approach within the companies' overall business strategy.

6.4 Contribution of the Study

The present research made an attempt to bring to clearer understanding the particular situation of GSCM implementation in the Greek manufacturing sector which has been so far an under researched field. Thus the study enlarges the body of literature about GSCM implementation in Greece and South Eastern Europe. It adds some insight into the current conditions of the national manufacturing industry seeking to find and redefine its place in the global supply chains. While in Greece the fields of logistics and supply chain management are of great interest to academics and to practitioners in this growing industry, the study highlights some weaknesses, strengths and the potential of Greek manufacturers in the implementation process of green supply chain management practices, a less researched area in this region.

The findings illustrate to what degree and by which mechanisms Greek manufacturers attempt to incorporate an effective greening strategy into their overall business strategy. The practical motivators and impediments in this effort are exemplified. Progress, shortcomings and possible pitfalls are demonstrated. The

research aims to contribute to the understanding of companies in the region of the potential how innovative GSCM practices can increase multidimensional company value. The necessity of a pro-active systematic approach is demonstrated and might inspire researchers and practitioners to further investigate into this direction. The study recommends a shift of paradigm for the selected industry sector in Greece Recommended is therefore a shift of paradigm in environmental strategy from previously focusing on cost reduction with potential positive side effects on environmental performance towards centering attention on improving environmental performance as a strong strategic goal under consideration of economic feasibility. The small steps already undertaken by the investigated case studies show the potential that a more decisive approach towards GSCM measures could have. The suggested shift of paradigm could also lead in Greece to a more contemporary attitude that would enable Greek companies to seek green market opportunities and secure their place in the global supply chains.

The present thesis has already achieved to partly close the aforementioned identified gap in the research landscape regarding Green Supply Chain Management practices in the region of South East Europe, and in particular in Greece. Parts of this research have served as a base for publications of research papers in conferences in Greece and abroad as well as in an international scientific journal. The full list of publications so far can be found in Appendix G. The aforementioned papers have been cited in several scientific journals and theses, of which some examples are listed in Appendix H. According to the 'Research Gate' database, the total read of the author's publications surpassed the threshold of 300. According to the same database the conference paper 'Green Innovation in Supply Chain Management – The Case of Greek Manufacturing' was the most read publication from the author's institution, achieved in the last week of July 2016, and at the same time period the author was named the most read author from his institution (Research Gate, 2016).

The author's expertise in GSCM has qualified him to contribute as a reviewer for scientific journals, such as the 'Journal of Manufacturing Technology Management' and others for the recent years. Moreover, the author has also contributed as a member of the work group 'Green development' for SEVE, the Greek International Business Association, located in Thessaloniki. The author has co-organized workshops in supply

chain & logistics in his institution where he has been also teaching modules in supply chain management and others in Greece and abroad (partly as module leader). The expertise gained through his research work in GSCM has qualified the author also to successfully supervise several Master theses at his institution.

6.5 Implications for Policy and Practice

The research findings show that manufacturing companies in Greece need to adopt a more systematic approach when aiming at implementing GSCM practices. It also became obvious that the state can play an important role in this process as an enabler. Certainly there is strong demand from the industry that the state would need to fulfil its task of controlling correct implementation of environmental regulations in the industry but beyond that the state could act as a supporter in providing the necessary infrastructure and help disseminate the necessary knowledge to change general market sensitivity. For the companies in the manufacturing sector the analysis of the findings suggest that a clear understanding of the individually given and the required conditions for successful GSCM implementation is a key factor.

6.6 Limitations of the Research

This research has a multitude of limitations. First of all the very restricted number of in-depth case studies does not allow any further generalization of the findings (Hamel et al., 1993). The long period of time that has passed since the collection of the primary data might give a somewhat distorted picture of the situation in Greece. Unfortunately, it was not possible to revisit the companies in order to update the data and see potential progress or regress. Another limitation could be seen in the fact that the author is not a native speaker of the Greek language while all interviews were conducted in Greek. Although there were no apparent misunderstandings during the interviews or in the translation process of the transcripts some unintended misunderstandings cannot be totally excluded. Another limitations lies in the fact that triangulation has been done to the extent of observations and additional documentations but without having the originally intended opportunity to explore first hand also related supply chain partners, especially foreign partners, of the companies under investigation. Limiting the research results is also the fact that they could have been discussed to an

even larger extent. Another limitation can be seen in the apparent neglect in the research of the very complex topic of the right approach to performance measurement beyond the theoretical basic remarks given in the literature review. The intention of the research was not on the quantitative aspect of performance measurement but rather on getting through qualitative data research a more general picture of how the companies in question approach the topic of GSCM implementation and how the managers involved feel and think about their own approach.

6.7 Suggestions for Future Research

Further research, which would hopefully be able to use this present study as a stepping stone, could aim to incorporate a broader industry survey also across different sectors. Interesting would be also to see in a longitudinal study how the approach and implementation of particular GSCM practices play out on the various aspects of value creation and what time horizon would need to be practically calculated. The particular aspect of cultural factors influencing the way green knowledge is managed could be more emphasized in a comparative study across different countries. Also a more interdisciplinary approach could be chosen to include, for example, behavioural studies in order to examine the decision making process for GSCM practices on an individual level in further detail. The impact and opportunities of the ever faster development of Information and Communication Technologies on GSCM is another aspect worth looking at.

6.8 Personal Note

A long journey has come to an end, and I seize this chance to look back for a brief moment. This PhD research has been a bumpy road full of challenges and full of rewards, full of disappointments and hardship and full of fulfilment and joy. On this path of searching for knowledge in a very particular subject I have been offered a wide variety of insights and experiences beyond that specific subject as I have not expected. I was offered opportunities to take responsibilities in academic life and to be able to share my (little) knowledge with others. ‘Disce et Doce’ as the motto of the University of Sheffield says, ‘Learn and Teach’ - it is a give and take. What I take with me as the most important insight from my PhD research experience is the following: It does not

really matter how big or small your contribution is to the (academic) body of knowledge. Knowledge is generated by the interaction of people and each contribution counts. Students, professors, researchers, scholars, they all together create that knowledge over time by reading, debating, criticizing, supporting, inspiring each other. I am thankful that I was allowed to become part of this process. I am well aware that it is a privilege that many people on earth do not have the luxury to enjoy.

But besides the experience of creating and sharing knowledge this journey has also confronted me with very personal insights into my own being. This PhD research process has brought out some of my arguably best and worst characteristics. I had to face them and come to terms with them. The path of research is a course of own responsibility. You cannot and should not hide behind anything or anybody; you cannot blame the others for your own shortcomings and flaws. It is a lane of self-reflection and maturing. I got to know myself better along the way.

So my experience of learning has been twofold and I am thankful for both aspects.

6.9 Conclusions

This chapter concludes the present research with a summary of the main objectives and findings, the contributions of the study, the possible implications on policy and practice, its limitations and the suggestions for further research.

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APPENDICES

Appendix A: Keywords for Literature Search, Databases, Major Journals

Sources for Green logistics & Green Supply Chain Management

Main databases:

For the relevant literature sources the following databases were searched: EBSCO, Web of Science, Scopus, Google Scholar and others.

Most titles found were found in the following databases:

- Business Source Complete (EBSCO)
- Business Source Premier (EBSCO)
- GreenFILE (EBSCO)
- Regional Business News (EBSCO)
- ScienceDirect
- Scopus
- IEEE xplore

Major scientific journals:

- Academy of Management Review
- Business Strategy and The Environment
- Computers & Operations Research
- Corporate Social Responsibility and Environmental Management
- Decision Sciences
- Decision Support Systems
- Ecological Economics
- Environmental Politics
- European Journal of Operational Research
- Human and Ecological Risk Assessment
- Industrial Marketing Management
- International Journal of Advanced Manufacturing Technology
- International Journal of Environment and Sustainable Development
- International Journal of Global Environmental Issues
- International Journal of Management Reviews
- International Journal of Organizational Innovation
- International Journal of Physical Distribution & Logistics Management
- International Journal of Production Economics
- International Journal of Production Research
- International Journal of Quality & Reliability Management
- International Journal of Retail & Distribution Management
- Journal of Business Ethics
- Journal of Cleaner Production
- Journal of Environmental Management
- Journal of Global Environmental Issues
- Journal of Supply Chain Management
- Journal of Operations Management
- Journal of the Operational Research Society

- Logistics Research
- Management Research Review
- Omega-International Journal of Management Science
- Operations Management Research
- Organization Studies
- Production and Inventory Management Journal
- Production and Operations Management
- Promet – Traffic & Transportation
- Resources, Conservation & Recycling
- Supply Chain Management: An International Journal
- Supply & Demand Chain Executive
- The Qualitative Report
- Transport
- World Journal of Entrepreneurship, Management and Sustainable Development

The following major keywords were used for the literature research:

- Cleaner production
- Corporate social responsibility
- Environmental management
- Environmental management systems
- Environmental performance
- Environmental policy
- Environmental purchasing
- Environmental regulations
- Environmental sustainability
- Environmental-friendly manufacturing
- Environmental-friendly supply chain
- Environment-friendly supply chain management
- Greek manufacturing
- Green design
- Green logistics
- Green manufacturing
- Green marketing
- Green operations
- Green packaging
- Green purchasing
- Green supplier selection
- Green supply chain
- Green supply chain management
- Green supply chain practices
- Green/ sustainable/ environment-friendly/ environmental friendly/ environmentally friendly ...
- Life-cycle-analysis
- Performance measurement

- Remanufacturing
- Reverse logistics
- Supply chain environmental management
- Sustainable development
- Sustainable manufacturing
- Sustainable supply chain
- Sustainable supply chain
- Sustainable supply network management
- Sustainable transportation
- Waste management

Appendix B: Taxonomy Table of Indicative Key Articles

Author(s)	Bowen F E, Cousins P D, Lamming R C and Faruk A C	Zhu Q, Sarkis J and Geng Y
Title	The role of supply management capabilities in green supply.	Green supply chain management in China: pressures, practices and performance.
Publication Type	Journal article	Journal article
Publication name	Production and Operations Management	International Journal of Operations & Production Management
Volume (Number)	10(2)	25(5)
Pages	174-89	449-68
Date/Year	2001	2005
Thematic Topic	Analysis of the role of **supply management capabilities** in green supply	Evaluating **GSCM drivers, practices and performance** in **China**
Concept/Theory	Focusing on development of firm's specialised **internal** resources; relationship with supplier	Defining **status-quo of GSCM** in Chinese manufacturing enterprises
Methodology	**Two-phase survey** of 70 operating units in public companies, broad cross-section of industries, "clean" and "dirty", semi-structured interviews, questionnaires, LISREL analysis	Survey questionnaire with **54 items**, 314 responses; **exploratory factor analysis** to make groupings; comparative analysis with previous research
Issue/Challenge	How to develop appropriate internal supply management capabilities in order to effectively implement green supply initiatives	Reaction of a transient economy to environmental pressures
Country	United Kingdom	China
Contribution	Development of a basic predictive model; Supply management capabilities are jointly developed by **proactive** corporate environmental attitude and more **strategic purchasing** and supply **management** approach; SMC facilitate implementation of product-based green supply but not greening the suply process <> contrary to current research	**Defintion of factors** for GSCM analysis; higher **awareness** in Chinese enterprises through external pressure but **no translation** into strong GSCM implementation
Supporting	Drumwright 1994; Cramer 1996; Green, Morton and New 1996; Lamming and Hampson 1996; Min and Galle 1997; Noci 1997	Russel 1998
Contradicting	partially Carter 1998	Min and Galle, 1997: US firms: potential liability and disposal cost-Chinese firms: regulatory issues; Zsidisin and Hendrick 1998: Western firms:investment recovery, Chinese firms: less important
Impact	Supporting **evaluation and development of corporate readiness** for green behaviour	extending GSCM research into **China**
Shortfall	small sample; unusual sampling strategy; **focusing only on purchasing function**	little previous research about China, **little comparison**; limited sample from special economic zones
Future direction	Role of firms internal capabilities in supporting environmental management in other process and functional areas besides purchasing and supply; different capabilities needed for different green initiatives?; > Resource-based perspective	Relationship between identified factors

Literature Table Green Supply Chain		
Author(s)	**Year**	**Thematic Topic and Contribution**
Koroneos, C.J. and Dompros, A.Th. Environmental assessment of the cement and concrete life cycle in Greece. International Journal of Environmental Technology and Management 2009; 10(1): 71-88	2009	Life Cycle Assessment (LCA) for the evaluation of the environmental performance of modern cement and concrete production in Greece.
Walker, Helen; Di Sisto, Lucio; McBain, Darian. Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. Journal of Purchasing & Supply Management 2008; 14: 69-85	2008	Drivers and barriers to GSCM in private and public sector. Exploratory study.
Park, Hoon; Russell, Clifford and Lee, Junsoo Lee (2007) National culture and environmental sustainability: A cross-national analysis. Journal of Economics and Finance 31(1): 104-121	2007	Significance of culture in examining the relationship between income and the environment. Examination of the relationship among scores on the Environmental Sustainability Index of the World Economic Forum and the four dimensions of national culture proposed and measured by Hofstede. Significant multidimensional interrelationships among the cultural and environmental sustainability measures. Limited applicability of the Environmental Kuznets Curve (EKC) when cultural variables are included.
Srivastava, S. K., 2007, Green supply-chain management: A state-of-the-art literature review. International Journal of Management Reviews, 9(1), 53-80.	2007	GSCM literature review; classification of topics; mapping of mathematical tools and techniques; timeline
Darnall, N., Jolley, J.G., Handfield, R. Environmental Management Systems and green Supply Chain Management: Complement for sustainability? Business Strategy and the Environment 2006; 18:30-45.	2006	Empirical evaluation of the relationship between EMS and GSCM practices.
Evangelinos, K.I. and Mami Oku, M. Corporate environmental management and regulation of mining operations in the Cyclades, Greece.' Journal of Cleaner Production 2006; 14(3-4): 262-70.	2006	Corporate environmental management in the mining sector of the Cyclades.
Kainuma Y, Tawara N. A multiple attribute utility theory approach to lean and green supply chain management. Int. J. Production Economics 2006; 101: 99–108.	2006	Managerial and environmental metrics for evaluating the performance of supply chains.
Orsato R. Competitive environmental strategies: When does it pay to be green? California management review. Winter 2006; 48(2): 127-43.	2006	Framework for categorising generic types of competitive environmental strategies. Classification scheme to optimize the economic return on environmental investments.
Richardson, B., O'Marah, K. and Weston, R. (editors). Supply Chain Saves the World. AMR Research. 2nd edition. November 2006; 67-110.	2006	Presentation of several aspects of green supply chain management and company performance. Proactiveness leads to competitive advantage and financial profit.
Chan R Y K. Does the Natural-Resource-Based View of the Firm Apply in an Emerging Economy? A Survey of Foreign Invested Enterprises in China. Journal of Management Studies May 2005; 42(3): 625-72.	2005	Conceptual model that shows the major determinants and consequences of the practice of natural-resource-based view of the firm. Foreign invested enterprises in China. Opportunities to enhance corporate environmental and financial performance through the adoption of environmental strategies.
Hervani A A, Helms M M and Sarkis J. Performance measurement for green supply chain management BIJ 2005; 12(4): 330-53.	2005	Overview of the various issues related to environmental supply chain management performance measurement. Integration of supply chain management, environmental management, and performance management into one integrative framework for study, design and evaluation of green supply chain management performance tools.
Husted, Bryan W. (2005) Culture and ecology: a cross-national study of the determinants of environmental sustainability. Management International Review 34: 349-372	2005	Inclusion of the aspect of national culture in ecological sustainability. Development of a model of the impact of culture based on Hofstede.
Preuss, L. The Green Multiplier: A Study of Environmnetal Protection and the Supply Chain. New York: Palgrave Macmillan; 2005.	2005	Theoretical model on purchasing function as an environmental change agent across supply chains.
Rao P, Holt D. Do green supply chains lead to competitiveness and economic performance? International Journal of Operations & Production Management 2005; 25(9): 898-916.	2005	Green supply chain management in South East Asia. Identification of potential linkages between green supply chain management, economic performance and competitiveness. amongst a sample of companies in South East Asia. Development of conceptual model.
Simpson D, Power D and Samson D. Greening the automotive supply chain: a relationship perspective. Australian Centre for International Business 2005 Oct; Working Paper 8	2005	Study of customer-supplier relationships and their impact on the environmental performance of automotive component suppliers. Development of conceptual model.
Wells P, Seitz M. Business models and closed-loop supply chains: a typology. Supply Chain Management: An International Journal. Sep 2005; 10(4): 249 – 51.	2005	Typologies that capture the relationship between closed-loop supply chains and value-added business models. Research agenda for the transition to sustainable business. Development of four new theoretical categories or typologies of closed-loop systems and their application to the context of the automotive industry. Conceptual, rather than empirical.

Zhu Q, Sarkis J and Geng Y. Green supply chain management in China: pressures, practices and performance. International Journal of Operations & Production Management 2005; 25(5): 449-68.	2005	Evaluation and description of GSCM drivers, practices and performance among Chinese manufacturing organizations. Survey questionnaire with 54 items using literature and industry expert input. Exploratory factor analysis for groupings.
Abukhader, S.M. & Jönson, G. (2004) 'Logistics and the environment: Is it an established subject?'. *International Journal of Logistics: Research & Applications*. 7(2), pp.137-49.	2004	Literature analaysis about connection between logistics/SCM and environment.
Geyer R, Jackson T. Supply loops and their constraints: the industrial ecology of recycling and reuse. California Management Review 2004; 46(2): 55-73.	2004	Presentation of a framework to identify and assess green supply loop strategies. Application to recycling and reuse of structural steel sections from end-of-life construction in the UK.
Sarkis, J., Meade, L. M., & Talluri, S. E-logistics and the natural environment. Supply Chain Management: An International Journal 2004; 9(4): 303-312.	2004	Impact of electronic logistics on environmental issues. Reverse e-logistics function.
Aragón-Correa, J.A. and Sharma, S. (2003) 'A contingent resource-based view of proactive corporate environmental strategy.' *Academy of Management Review*. 28(1), pp.71-88.	2003	Influence of general competitive environment on development of a proactive environmental strategy of a company, based on contingency, dynamic capabilities, and the natural resource- based view of the firm.
Murphy, P. R. and Poist, R. F. Green perspectives and practices: A "comparative logistics" study. Supply Chain Management: An International Journal 2003; 8(2): 122-131.	2003	Comparison of US and non-US firms with respect to environmental practices.
Schiebel, W. and Pochtrager, S. Corporate ethics as a factor for success: the measurement instrument of the University of Agricultural Sciences, Supply Chain Management: an International Journal 2003; 8(2): 116-21.	2003	Positive economic impact of corporate social responsibility (CSR). Measuring CSR. also affects additional benefits.
Sroufe R S. Effects of environmental management systems on environmental management practices and operations. Production and Operations Management 2003; 12(3): 416–431.	2003	Empirical insights to EMS practices based on the largest EMS survey of manufacturing firms in the United States. Test for a relationship between environmental management systems and perceived operations performance while considering direct and indirect effects of various environmental practices. Several field studies. New information for EMS theory development. Shows positive relationship between EMS, environmental practices of a firm and operations performance measures.
Bowen F E, Cousins P D Lamming R C and Faruk A C. Analyzing, Mapping, and Managing Environmental Impacts along Supply Chains. Journal of Industrial Ecology 2002; 5(2): 13-36	2002	Means for analyzing, mapping, and managing environmental impacts along supply chains. Development of management tool called "ecological supply chain analysis" (EcoSCAn).
Handfield R, Walton S V, Sroufe R and Melnyk S A. Applying environmental criteria to supplier assessment: a study in the application of the analytical hierarchy process. European Journal of Operational Research 2002; 141: 70-87.	2002	Introducing environmental dimension into purchasing decisions. Use of structured analysis to evaluate suppliers along environmental dimensions. Analytical Hierarchy Process (AHP) as a decision support model. Three case studies. Incorporation of AHP into a comprehensive information system supporting Environmentally Conscious Purchasing (ECP).
Melnyk S A, Sroufe R P and Calatone R. Assessing the impact of environmental management systems on corporate and environmental performance. Journal of Operations Management 2002; 21(2): 329-51.	2002	Evaluation of assumption that EMS is critical to a firm's ability to reduce waste and pollution while simultaneously improving overall performance.
Rao P. Greening the supply chain: a new initiative in South East Asia. International Journal of Operations & Production Management 2002; 21(6): 632-55.	2002	Greening of suppliers. Link between environmental performance and competitiveness, competitiveness and economic performance.
Bowen F E, Cousins P D Lamming R C and Faruk A C. Horses for courses: explaining the gap between theory and practice of green supply. Greener Management International 2001; 35:41-60.	2001	Examination of green supply practices adopted by particular types of firms in UK and their performance implications.
Bowen F E, Cousins P D Lamming R C and Faruk A C. The role of supply management capabilities in green supply. Production and Operations Management 2001; 10(2): 174-89.	2001	Analysis of the role of supply management capabilities in green supply. Focus on the development and deployment of specialised internal resources developed by a proactive corporate environmental attitude. Development of basic predictive model.
Chan R Y K, Lau L B Y. Explaining green purchasing behavior: a cross-cultural study on American and Chinese consumers. Journal of International Consumer Marketing 2001; 14 (2/3): 9-41.	2001	Applicability of the Theory of Planned Behaviour (TPB) to green purchasing behaviour of consumers in the Chinese and U.S. cultural settings.
Christmann P, Taylor G. Globalization and the environment: determinants of firm self-regulation in China. Journal of International Business Studies 2001; 32(3): 439-58.	2001	Positive environmental effects of globalisation due to increasing self-regulation pressures on firms in low-regulation countries. Survey of firms in China shows that multinational ownership, multinational customers and exports to developed countries increase self-regulation of environmental performance
Curran M A. Developing a tool for environmentally preferable purchasing. Environmental Management and Health 2001; 12(3): 244-53.	2001	Life cycle assessment (LCA) - based guidance developed by the US Environmental protection agency EPA under the Framework for Responsible Environmental Decision-making (FRED) effort to demonstrate how to conduct a relative comparison between product types to determine environmental preferability. Description how to calculate numeric impact indicators for a given product or service across eight selected human health and environmental impact categories.

Ferguson N, Browne J. Issues in end-of-life product recovery and reverse logistics. Production Planning & Control July 2001; 12(5): 534-47.	2001	Responsibility of manufacturers to cover the entire life of certain products, including safe disposal. Examination of information requirements for reverse logistics within the Extended Enterprise. Study of end-of-life vehicles (ELVs).
Harvey B, Schaefer A. Managing relationships with environmental stakeholders: a study of UK water and electricity utilities. Journal of Business Ethics 2001; 30(3): 243-52.	2001	Study of the approach of six U.K. water and electricity companies towards managing the relationship with their 'green' stakeholders.
Min H, Galle W P. Green purchasing practices of US firms. International Journal of Operations & Production Management. Sep 2001; 21(9):1222 - 38	2001	Configuration of a green purchasing strategy. Survey of US firms with greater environmental risks. Identification of variables that either promote or inhibit the successful implementation of green purchasing and evaluation of effects of green purchasing on the firm's supplier selection, waste management, packaging, and regulatory compliance.
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Wagner M, Schaltegger S and Wehrmeyer W. The relationship between the environmental and economic performance of firms: what does theory propose and what does empirical evidence tell us? Greener Management International 2001; 34: 95-108.	2001	Functional relationships between environmental and economic performance rooted in different theoretical frameworks. Empirical studies that investigate this relationship and it analyses their results (event studies, portfolio studies and multiple regression studies). Environmental and economic performance measures applied. Identification of a statistical, methodological and data issues.
Bansal, P. and Roth, K. (2000) 'Why companies go green: a model of ecological responsiveness.' *Academy of Management Journal*. 43(4), pp.717-36.	2000	Study of motivations and contextual factors inducing corporate ecological responsiveness.
Borzel, T.A. Why there is no Southern Problem. On Environmental Leaders and Laggards. Journal of European Public Policy 2000; 7(1): 141-162.	2000	Issues of (non)-compliance with EU (environmental) laws in South European countries.
Geffen C, Rothenberg S. Suppliers and environmental innovation – The automotive paint process. International Journal of Operations & Production Management 2000; 20(2):166-186.	2000	Automobile assembly plants responses to environmental pressures. Partnerships between original equipment manufacturers and their suppliers in improving the environmental performance of manufacturing operations. Three case studies of US assembly plants.
Hanna M D, Newman W R and Johnson P. Linking operational and environmental improvement through employee involvement. International Journal of Operations & Production Management 2000; 20(2): 148-65.	2000	Exploration of the relationships between process type, operational performance, employee involvement, and environmental performance.
Sharma S. Managerial interpretations and organizational context as predictors of firm choice of environmental strategies. Academy of Managemnt Journal 2000; 43: 681-97.	2000	Examination of relationship between managerial attitude towards environmental issues and choice of corporate environmental strategy among 99 firms in the Canadian oil and gas industry.
Winn M I, Angell L C. Towards a process model of corporate greening. Organization Studies 2000; 21(6): 1119-47.	2000	Internal processes of corporate greening. Two-study investigation of consumer goods producers. Exploratory factor analysis gives two independent dimensions of environmental management: Policy commitment and approach to implementation. Typology of four types of corporate greening.
Beamon, B.M. (1999) 'Designing the green supply chain.' *Logistics Information Management*. 12(4), pp.332-42.	1999	Investigation of environmental factors leading to the development of an extended environmental supply chain. Presentation of performance measures appropriate for the extended supply chain. Development of general procedure towards achieving and maintaining green supply chain.
Henriques I, Sadorsky P. The relationship between environmental commitment and managerial perceptions of stakeholder importance. Academy of Management Journal 1999; 42(1): 87-99.	1999	Investigation if firms committed to stewardship of the natural environment differ from less environmentally committed firms in their perceptions of the relative importance of different stakeholders in influencing their environmental practices.
Klassen R D, Whybark D C. The impact of environmental technologies on manufacturing performance. Academy of Management Journal 1999; 42: 599–615.	1999	Development of 'Environmental technology portfolio' as a new construct grounded in the resource-based view of the firm and manufacturing strategy.

Aragón-Correa J.A. (1998) 'Strategic proactivity and firm approach to the natural environment.' *Academy of Management Journal* . 41(5), pp.556-567.	1998	Proactive business strategy and environmental strategy
Green K, Morton B and New S. Green purchasing and supply policies: do they improve companies' environmental performance? Supply Chain Management 1998; 3(2): 89–95.	1998	Case study activities of the UK hardware retailer, B&Q, on how does green purchasing change the environmental performance of the firms in a supply chain/network and what is the influence of supply chain and industry structure on that performance.
Judge W Q, Douglas T J. Performance implications of incorporating natural environmental issues into the strategic planning process: An empirical assessment. Journal of Management Studies 1998; 35: 241–262.	1998	Ability of firms to integrate the natural environment into the strategic planning process within the natural resource-based view. Survey across industries in the USA. Structural equation modelling with LISREL technique.
McIntyre, K., Smith, H.A., Henham, A. and Pretiove, J. Environmental performance indicators for integrated supply chains: the case of Xerox Ltd. Supply Chain Management: an International Journal 1998; 3(3):149-156.	1998	Integrated Supply Chain at Xerox. Use of environmental bias in the decision making process.
Nehrt C. Maintainability of first mover advantages when environmental regulations differ between countries. Academy of Management Review 1998; 23: 77–97.	1998	Examination of competitive conditions of firms in environment of stricter environmental regulations. Development of new pollution-reduction paradigm based on lowering costs by reducing pollution.
Sharma S, Vredenburg H. Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. Strategic Management Journal 1998; 19: 729–753.	1998	Proactive responsiveness to ecological challenges lead to unique organizational capabilities and improvement of firm competitiveness. Case studies and mail survey.
Russo M, Fouts P. A resource-based perspective on corporate environmental performance and profitability. Academy of Management Journal1997; 40(3): 534-559.	1997	Based on the resource-based view. Industry growth as a an important factor for the positive relationship between environmental performance and economic performance.
Florida R. Lean and green: the move to environmentally conscious manufacturing. California management review 1996; 39(1,): 80-105.	1996	Relationship between advanced production practices and innovative approaches to environmentally conscious manufacturing.
Hart S L, Ahuja G. Does it pay to be green: an empirical examination of the relationship between emission reduction and firm performance. Business Strategy and the Environment 1996; 5(1): 30-7.	1996	Emissions reduction and pollution prevention has a positive impact on the bottom line. Marginal costs of reducing emissions do not exceed marginal benefits.
Klassen R D, McLaughlin C P. The impact of environmental management of firm performance. Management Science 1996; 42(8): 1199-215.	1996	Proposal of a theoretical model linking strong environmental management to improved perceived future financial performance.
Gallarotti G M. It pays to be green: The managerial incentive structure and environmentally sound strategies. The Columbia Journal of World Business environment Winter 1995: 38-57.	1995	Better cost-effectiveness and manageriall compatibility of voluntary environmental strategy. Need to adapt to green pressures in vertical relations with suppliers and distributors and in complementarities in production.
Hart S. A natural-resource based view of the firm. Academy of Management Review 1995; 20(4).	1995	Proposing a natural-resource-based view of the firm—a theory of competitive advantage based upon the firm's relationship to the natural environment.
Porter M, Van der Linde C. Toward a new conception of the environment-competitiveness relationship. Journal of Economic Perspectives 1995; 9(1): 97-118.	1995	Stimulating innovation and efficiency, strict environmental regulations can enhance competitiveness. Focus on resource productivity.
Shrivastava P. Environmental technologies and competitive advantage. Strategic Management Journal 1995; 16: 183–200.	1995	Concept of environmental technologies to gain competitive advantage. Benefits of and barriers to implementing environmental technologies and implications for strategic management.
Starik M, Rands G P. Weaving an integrate web: Multilevel and multisystem perspectives of ecologically sustainable organizations. Academy of Management Review 1995; 20: 908-935.	1995	Examination of concept of ecological sustainability at the individual, organizational, political-economic, social-cultural, and ecological environment levels.
Wu H J, Dunn S C. Environmentally responsible logistics systems. International Journal of Physical Distribution & Logistics Management 1995; 25(2): 20-38.	1995	Discussion of the measures to achieve proactive environmental management focus. Discussion of environmentally related logistics activities. Explanation for environmental logistics in the value chain. Discussion of transport and reverse logistics. Managerial implications
Porter M E. America's green stragtey. Scientific America 1991; 264(4): 168.	1991	Suggestion that economic competitiveness and environmental improvement should be complementary

Appendix C: Case Study Protocol

Case study protocol for Company A (Name)

A. Introduction to the case study and purpose of protocol

a. Background

With increasing public concern about the deteriorating impact of industrial activities on the environment, green practices find more and more access into the strategic and operational planning of enterprises. Green supply chain management (GSCM) has emerged as a key approach for enterprises aiming to become environmentally sustainable.

GSCM is seen as a modern concept of management practices attempting to integrate environmental thinking to all stages up and down the supply chain entailing inbound logistics, production, outbound logistics and reverse logistics operations. Such practices entail, for example, assessment and selection of suppliers according to their environmental performance, vendor selection on the base of their green management practices, reducing packaging and waste, or applying green design practices in new product development.

In a globalized market the environmental performance criteria extend beyond the single firm to its entire supply chain across national borders. But environmental consciousness and environmental protection differ to a wide degree between countries. Green supply chain management is still a rather new research development in the countries of South East Europe and there is a gap of theoretical and empirical research for this region. Countries, such as Greece, with an emerging environmental sensitivity are characterized by a more relaxed implementation of environmental legislation and regulations, less advanced clean technologies and less sophisticated GSCM practices compared to countries with a more advanced environmental sensitivity.

The goal of this research is to attain a clearer and scientifically-based understanding of the way how environmentally conscious business processes can be more effectively and efficiently implemented in the supply chain of manufacturing enterprises in Greece and what effect this can have on their environmental, operational, social and economic performance.

b. References, relevant readings

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

c. Case study questions

The main research questions of the present investigation are:

1. What are the opportunities and obstacles regarding the implementation of GSCM in Greece? How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved? What are the critical success factors?
2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, social and economic) performance, including the use of tools and performance indicators?
3. Why are GSCM practices fundamental in future industry performance?

(For the complete interview guide see attachment …)

d. Theoretical framework for the case study

This study generally assumes an inductive strategy but refers to relevant existing theoretical frameworks to compare its own findings and conclusions. The existing theoretical frameworks which relate to GSCM and can serve as reference point for this study are the resource-based view of the firm, the competence-based view and the relational view of collaborative advantage.

e. Role of protocol in guiding the case study investigator

This case study protocol aims to serve as a standardized agenda for the inquiry.

B. Data collection procedures

a. Names of sites to be visited, including contact persons

Company:
[redacted] (blackened for anonymity reasons)
[redacted]

(Close to Thessaloniki) .
[redacted] .

[redacted]

[redacted]

[redacted]

Contact person: Mr. [redacted], Director of Marketing

Interviewees:

Mr. [redacted] Director of Marketing
Mr. [redacted] Technical Manager
Mrs. [redacted] Logistics Manager
Mr. [redacted], Quality Assurance Manager
Mr. [redacted] Plant floor manager

b. Data collection plan

The plan is to conduct interviews with key personnel and visit the site.

1. The first company visit is scheduled for 10-03-2010, 14.00h-16.00h:

Planned interviews with [redacted] Director of Marketing, [redacted] Technical Manager

2. The second company visit is scheduled for 11-03-2010, 14.00h-16.00h:

Planned interview with Mrs. [redacted] Logistics Manager and Mr. [redacted], Quality Assurance Manager

3. The third company visit is scheduled for 12-03-2010, 15.00h-16.00h: Guided tour of the factory by Mr. …..... Plant floor manager
4. Time to drive to company: ca. 1 hour
5. Estimated preparation time for each visit: 30 min-1hour
6. Estimated time for transcription, translation and writing case study report: total time 30 hrs

c. Expected preparation prior to site visits

i. Interviewees have received letter of introduction with relevant background information and the interview guide (for letter of introduction see attachment ...)
ii. Look into website, get familiar with products and personnel (biography, experience), activities, green actions, read newsletters, get informed about competitors
iii. Search web for press articles

C. Outline of case study report

a. Company's environmental strategy

b. Major driving forces for engaging in GSCM
c. Environmental management within company
d. Environmental management beyond company boundaries
e. Environmental performance
f. Value creation
g. Overcoming impediments
h. Social aspects
i. Attachments: references to relevant documents, list of persons interviewed

D. Case study questions

See attachment ...

Appendix D: Interview Guide with Introduction

Interview Guide for GSCM Practices in Greek Manufacturer Enterprises

DESIGN AND IMPLEMENTATION OF GREEN SUPPLY CHAIN MANAGEMENT IN EMERGING ENVIRONMENTS: THE MANUFACTURING SECTOR IN GREECE

A PhD research by Andreas Baresel-Bofinger,
South-East European Research Centre (SEERC) Thessaloniki,
Research Centre of the University of Sheffield and CITY Liberal Studies

Introduction:

With increasing public concern about the deteriorating impact of industrial activities on the environment, green practices find more and more access into the strategic and operational planning of enterprises. Green supply chain management (GSCM) has emerged as a key approach for enterprises aiming to become environmentally sustainable.

GSCM is seen as a modern concept of management practices attempting to integrate environmental thinking to all stages up and down the supply chain entailing inbound logistics, production, outbound logistics and reverse logistics operations. Such practices entail, for example, assessment and selection of suppliers according to their environmental performance, vendor selection on the base of their green management practices, reducing packaging and waste, or applying green design practices in new product development.

In a globalized market the environmental performance criteria extend beyond the single firm to its entire supply chain across national borders. But environmental consciousness and environmental protection differ to a wide degree between countries. Green supply chain management is still a rather new research development in the countries of South East Europe and there is a gap of theoretical and empirical research for this region. Countries, such as Greece, with an emerging environmental sensitivity are characterized by a more relaxed implementation of environmental legislation and regulations, less advanced clean technologies and less sophisticated GSCM practices compared to countries with a more advanced environmental sensitivity.

The goal of this research is to attain a clearer and scientifically-based understanding of the way how environmentally conscious business processes can be

more effectively and efficiently implemented in the supply chain of manufacturing enterprises in Greece and what effect this can have on their environmental, operational, social and economic performance.

Taking part in the interview is entirely voluntary which means that you can withdraw at any time without any consequences. The interview is conducted for purely research reasons and your answers will be used only for that purpose. Your personal data and answers will remain confidential and secure throughout the entire process.

Research Questions:

The main research questions of the present investigation are:

1. What are the opportunities and obstacles regarding the implementation of GSCM in Greece? How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved? What are the critical success factors?
2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, social and economic) performance, including the use of tools and performance indicators?
3. Why are GSCM practices fundamental in future industry performance?

Interview questions:

Note: The information gained during this interview will be treated confidentially and will only be used by myself for the purposes of academic research.

A. Organisation profile

a. Main activity/products, size, main markets
b. Organisation's objectives, culture, values
c. Structure of your supply chain; stakeholders in your input/output, regulatory, and competitive environment (authorities, competitors, suppliers, customers, pressure groups, etc.)

B. Organisation's environmental strategy

a. What is your organisation's attitude towards environmental issues?
b. How would you describe your organisation's environmental strategy?
c. Are there any recent examples of initiatives to address environmental challenges in your supply chain?
d. Is there any specific stated course of action?
   If yes why? If not why?

e. How important are environmental criteria compared to other criteria in decision making?

f. Is there anything that you would like to add?

C. What are the major driving forces for your organisation to engage in green management practices?

a. Internal

(Shareholders, Employees, Personal values, Economic factors (cost pressure, liability issues, bigger market share, risk management), Others)

b. External

i. Which demands do you face from your input/output, regulatory, and competitive stakeholders?

1. Legislation (international, national, regional, export countries)
2. Regulations (industry standards, voluntary agreements, etc.)
3. Supply chain factors (customer demands, suppliers' advances, etc.)
4. Other market forces (competitors' strategies, pressure groups, reputation, brand, etc.)

c. Can you identify any other drivers?

d. How important do you consider the implementation of green supply chain management practices in your organisation to achieve a competitive advantage?

e. Is there anything that you would like to add?

D. Environmental management <u>within organisation</u>

a. To what extent does (senior and mid-level) management support implementation of environmental practices?

b. What kind of management tools do you use for environmental issues? (analytical tools, procedural tools): Environmental Management System (EMS), Life Cycle Analysis, Eco-Design, Eco-Audit, ISO, Environmental Performance Evaluation (EPS), ,etc.)

c. What kind of measurable targets does your company apply for environmental goals? (decrease of cost for energy consumption/ investment in more energy efficient equipment, materials input/decrease of cost for materials purchasing, air emissions reduction, decrease of scrap rate, tons of products recycled, etc.)

d. Is your company participating in any environmental group or programme? (projects submitted for environmental programmes?)

e. Do you have ISO 14000 (…) certification or any other external or internal certification?

f. Does your company produce environmental reports?

g. What are the cross-functional cooperations for environmental improvements?

h. Who is held accountable for which part of green practice implementation?

i. What kind of environmental training programmes for employees does the organisation offer?

j. What is the critical know-how that you are accumulating in the process of implementing green practices and what are the mechanisms through which you administer it?

k. What is the information flow inside the company regarding implementation of green practices?

l. Is there anything that you would like to add?

E. GSCM practices <u>beyond company boundaries</u>

a. How do you respond to the demands that you face from your input/output, regulatory, and competitive stakeholders (authorities, investors, suppliers, customers, competitors, pressure groups, community, etc.)

    i. What are your actions/principles regarding your downstream supply chain (recycling, disposal, etc)?

b. Which demands do you actively place on these parties?

    i. What are your actions/principles regarding your upstream supply chain? (green purchasing measures, supplier selection, etc.)

c. Please describe the level of cooperation with your supply chain members?

    i. How do you cooperate with suppliers for environmental objectives? What are the decision making-criteria and the performance measurement tools? (design specifications, environmental audit, etc.)

    ii. How do you cooperate with customers for environmental objectives? (eco-design, green packaging, etc.)

    iii. How do you manage the exchange of relevant know-how among supply chain partners and with other stakeholders (authorities, associations,etc.) in order to facilitate the implementation of green practices?

d. What kind of information do you exchange with these parties?

e. Up/down to which tier do you apply which environmental principles?

f. Do your actions differ regarding the direct product chain (production related material) and the supporting supply chain (provision of machinery and process technology, provision of energy, services and non-production related materials)?

g. Is there anything that you would like to add?

F. Environmental performance

a. What are the measure indicators for environmental performance and what difference do you see after implementation of green practices?

   i. What are the effects of your environmental practices on reduction of emissions and waste in all stages of the supply chain? (air emissions, solid waste, liquid waste in inbound logistics, purchasing, materials management, production, outbound logistics and reverse logistics), e.g. tons of products recycled, decrease of scrap rate

   ii. What are the effects of your environmental practices on reduction of consumption? (energy, water and raw materials in inbound logistics, production, outbound logistics and reverse logistics, energy consumption of product), e.g. decrease of cost for energy consumption

b. What measurement tools and methods do you apply (analytical and procedural)?

c. Is there anything that you would like to add?

G. Value creation

a. What are the cost saving effects of your green supply chain management practices?

b. What are the cost increasing effects of your green supply chain management practices?

c. What is the effect on operational factors of your green supply chain management practices, (such as improved capacity utilization, increased product line, infrastructure, etc.)?

d. Can you identify any factors that contribute to a competitive advantage that you achieve through the implementation of GSCM practices? (e.g. better risk management)

e. What is the effect on the company's image/reputation?

f. In what way does the accumulation of specialized know-how through implementation of green supply chain management practices contribute to better company performance?

g. In what way do you think your green supply chain management practices create value for the company?

h. Is there anything that you would like to add?

H. Impediments, lessons learnt and future plans

a. Can you identify the critical success factors for the implementation of GSCM practices in your organisation?

    i. What impediments did you encounter when implementing green supply chain management practices and how did you overcome them? (e.g. cost implications, lack of knowledge and skills, lack of technology, low priority of green issues, time constraints, etc.)

b. What are the major lessons that your organisation has learnt from the experience?

c. Which support do you get from other stakeholders?

d. How do you see the future development of environmental practices on a global, national, regional level?

e. What impact do you think this development will have on your organisation's supply chain and your organisation's environmental strategy/GSCM?

f. Is there anything that you would like to add?

I. Social Aspects of Green Supply Chain Management

a. Where can you identify improvements in standards of occupational health and safety through implementation of green practices?

b. To what extent does the implementation of GSCM practices improve your company's overall transparency to your stakeholders?

c. To what extent are employees encouraged to be creatively involved in the decision making process for implementation of green practices?

d. What effects has GSCM implementation on employee training, employee motivation, employee turnover and recruitment?

e. What are the benefits to the local community?

f. Are you sourcing more from local enterprises?

g. Is there anything that you would like to add?

J. Would you like to add anything that has not been covered in this interview?

Thank you very much for your time and effort.

Appendix E: Match of Interview Guide with Research Questions

Fit of Interview Guide with Research Objectives and Research Questions							
	Research Objectives				Research Questions		
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
A. Organisation profile	x		x	x	x		
a. Main activity							
b. Organisation's objectives, culture, values	x		x	x	x		
c. Who are your collaboration partners in your input/output, regulatory, and competitive stakeholder environment?							
i. (Primary) suppliers (in SEE)							
ii. Who are your main suppliers?							
iii. Customers (in SEE and others) Who are your main customers?							
iv. Authorities, associations, etc.							
v. Competitors, (industry sectors)							
d. Is there anything that you would like to add?							
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
B. Organisation's environmental strategy	x	x	x	x	x	x	x
a. What is your organisation's attitude towards environmental issues?	x		x	x	x		
b. How would you describe your organisation's environmental strategy?	x	x	x	x	x		x
c. Are there any recent examples of initiatives to address environmental challenges in your supply chain?	x	x	x	x	x	x	x
d. Is there any specific stated course of action? If yes why? If not why?	x		x	x	x	x	
e. How important are environmental criteria compared to other criteria in decision making?	x		x	x	x	x	
f. Is there anything that you would like to add?							
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
C. What are the major driving forces for your organisation to engage in green management practices?	x		x	x	x		x
a. Internal	x		x	x	x		x
i. Shareholders	x		x	x	x		x
ii. Employees	x		x	x	x		x
iii. Personal values	x		x	x	x		x
iv. Economic factors (cost pressure, liability issues, bigger market share, etc)	x		x	x	x		x
b. External	x		x	x	x		x
i. Which demands do you face from your input/output, regulatory, and competitive stakeholders?	x		x	x	x		x
1. Legislation (international, national, regional, export countries)	x		x	x	x		x
2. Regulations (industry standards, voluntary agreements, etc.)	x		x	x	x		x
3. Supply chain factors (customer demands, suppliers' advances, etc.)	x		x	x	x		x
a. How do you think your customers appreciate green products?	x		x	x	x		x
4. Other market forces (competitors' strategies, pressure groups, reputation, brand, etc.)	x		x	x	x		x
c. How important do you consider the implementation of green supply chain management practices in your organisation to achieve a competitive advantage?	x		x	x	x	x	x
d. Is there anything that you would like to add?							

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	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
D. Environmental management within organisation	x		x	x	x	x	
a. To what extent does management support implementation of environmental practices?	x		x	x	x		
b. What kind of management tools do you use for environmental issues? (analytical tools, procedural tools)	x		x	x	x	x	
c. What kind of measurable targets does your company apply for environmental goals?	x		x	x	x	x	
d. Is your company participating in any environmental group or programme?	x		x	x	x		
e. Do you have ISO 14000 (…) certification or any other external or internal certification?	x		x	x	x		
f. Does your company produce environmental reports?	x		x	x	x		
g. What are the cross-functional cooperations for environmental improvements?	x		x	x	x	x	
h. What kind of training programmes does the organisation offer?	x		x	x	x		
i. What are the critical knowledge assets that you are accumulating in the process of implementing green practices and what are the mechanisms through which you administer them?	x		x	x	x	x	
j. What is the information flow inside the company regarding implementation of green practices?	x		x	x	x	x	
k. Is there anything that you would like to add?							
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
E. GSCM practices beyond company boundaries	x		x	x	x	x	
a. How do you respond to the demands that you face from your input/output, regulatory, and competitive stakeholders?	x		x	x	x	x	
i. What are your actions/ principles regarding your downstream supply chain (recycling, disposal, etc)?	x		x	x	x		
b. Which demands do you actively place on these stakeholders?	x		x	x	x	x	
i. What are your actions/principles regarding your upstream supply chain? (green purchasing measures, supplier selection, etc.)	x		x	x	x		
c. How close do you cooperate with these stakeholders? (Please describe the level of cooperation)	x		x	x	x		
i. How do you cooperate with suppliers for environmental objectives? What are the decision making-criteria and the performance measurement tools? (design specifications, environmental audit, etc.)	x		x	x	x	x	
ii. How do you cooperate with customers for environmental objectives? (eco-design, green packaging, etc.)	x		x	x	x		
iii. How do you manage the exchange of relevant know-how among supply chain partners and with other stakeholders in order to facilitate the implementation of green practices?	x		x	x	x		
d. What kind of information do you exchange with these stakeholders?	x		x	x	x		
e. Up/down to which tier do you apply which environmental principles?	x		x	x	x		
f. Do your actions differ regarding the direct product chain and the supporting supply chain (provision of machinery and process technology, provision of energy, services and non-production related materials)?	x		x	x	x		
g. Is there anything that you would like to add?							
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F. Environmental performance		x		x		x	x
a. What are the measure indicators for environmental performance and what difference do you see after implementation of green practices?		x		x		x	x
i. What are the effects of your environmental practices on reduction of emissions and waste in all stages of the supply chain? (air emissions, solid waste, liquid waste in inbound logistics, purchasing, materials management, production, outbound logistics and reverse logistics)		x		x		x	x
ii. What are the effects of your environmental practices on reduction of consumption? (energy, water and raw materials in inbound logistics, production, outbound logistics and reverse logistics, energy consumption of product		x		x		x	x
b. What measurement tools and methods do you apply (analytical and procedural)?	x	x	x	x	x	x	x
c. Is there anything that you would like to add?							

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	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
G. Value creation		x	x	x		x	x
a. What are the cost saving effects of your green supply chain management practices?		x		x		x	x
b. What are the cost increasing effects of your green supply chain management practices?		x		x		x	x
c. What is the effect on operational factors of your green supply chain management practices, (such as improved capacity utilization, increased product line, infrastructure, etc.)?		x		x		x	x
d. Can you identify any factors that contribute to a competitive advantage that you achieve through the implementation of GSCM practices?		x		x		x	x
e. In what way does the accumulation of specialized know-how through implementation of green supply chain management practices contribute to better company performance?		x	x	x		x	x
f. In what way do you think your green supply chain management practices create value for the company?		x	x	x		x	x
g. Is there anything that you would like to add?							
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
H. Impediments, lessons learnt and future plans	x		x	x	x		x
a. Can you identify the critical success factors for the implementation of GSCM practices in your organisation?	x		x	x	x		x
i. (If you want, please refer to the driving forces in question C)	x		x	x	x		x
b. What impediments did you encounter when implementing green supply chain management practices and how did you overcome them?	x		x	x	x		x
c. What are the major lessons that your organisation has learnt from the experience?	x		x	x	x		x
d. Which support do you get from other stakeholders?	x		x	x	x		x
e. How do you see the future development of environmental practices on a global, national, regional level?	x		x	x	x		x
f. What impact do you think this development will have on your organisation's supply chain and your organisation's environmental strategy/GSCM?	x		x	x	x		x
g. Is there anything that you would like to add?							
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
I. Social Aspects of Green Supply Chain Management		x		x		x	
a. Where can you identify improvements in standards of occupational health and safety through implementation of green practices?		x		x		x	
b. To what extent does the implementation of GSCM practices improve your company's overall transparency to your stakeholders?		x		x		x	
c. To what extent are employees encouraged to be creatively involved in the decision making process for implementation of green practices?		x		x		x	
d. What effects has GSCM implementation on employee training, employee motivation, employee turnover and recruitment?		x		x		x	
e. What are the benefits to the local community?		x		x		x	
f. Are you sourcing more from local enterprises?		x		x		x	
g. Is there anything that you would like to add?							
	1. Examine on a firm level opportunities and obstacles regarding the implementation of GSCM in Greece	2. Analyse how and to what degree the implementation of green supply chain management practices affects the environmental, operational, economic and social performance of the manufacturing companies in Greece	3. Identify the critical success factors for implementation of GSCM in Greek manufacturing companies and ways to minimize the effects of impeding factors and to enhance the enabling factors	4. Propose a framework for efficient implementation of GSCM practices that could be adopted by companies in the transient economies of South-East Europe	1. How can the implementation of GSCM practices in companies in countries with an emerging environmental sensitivity be improved?	2. What are the implications of implementation of GSCM practices for the organisation's (environmental, operational, economic and social) performance, including the use of tools and performance indicators?	3. Why are GSCM practices fundamental in future industry performance?
I. Would you like to add anything that has not been covered in this interview?	x	x	x	x	x	x	x

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Appendix F: Interview Statistics

Interview statistics			
Company	**interviews**	**interviewees**	**visits**
Company A	**5**	**5**	**3**
Technical Manager& Logistics Manager	1	a,b	A
Logistics Manager	1	b	B
Quality Assurance Manager, Director of Marketing, Logistics Manager	1	b,c,d	B
Quality Assurance Manager	1	c	C
Plant Floor Manager	1	e	C
Tour of factory			A,C
Company B	**5**	**5**	**2**
Purchasing Manager	1	a	A
Technical Support & Marketing Manager	1	b	B
Director of Quality Assurance and Control	1	c	B
Production Manager	1	d	B
Tour of factory			B
Administrative Manager	1	e	B
Company C	**4**	**3**	**2**
General Manager	1	a	A
Commercial Director	1	b	A
Technical Director	1	c	A
Technical Director (cont'd.)	1	c	B
Tour of factory			A,B
Company D	**2**	**2**	**2**
Purchasing Manager	1	a	A
Plant Director Hydraulic & Traction Elevation	1	b	B
Tour of factory			B
Company E	**2**	**2**	**2**
General Manager	1	a	A
Logistics Manager	1	b	A
Tour of warehouse			B
TOTAL	18	17	11

Appendix G: Publications

This is a list of my publications over the past years that are partly based on the present research.

Bendic, N., Baresel-Bofinger, A. (2015). *Improving the Cold Supply Chain for Fresh Agricultural Food Products between Serbia and Western Europe*. *In 1st International Conference of Agrifood SCM and Green Logistics. Porto Carras, Greece*

Baresel-Bofinger, A., Ketikidis, P. H., Zaharis, N. (2015). *Impediments and Needs of Start-ups and Investors in South-East Europe for Investment Readiness and Growth*. In 10th European Conference on Innovation and Entrepreneurship.

Baresel-Bofinger, A., Ketikidis, P. H., Zaharis, N., Kandiliari, F. (2014). *Fostering cross-border early stage funding for innovative SMEs in the region of South-East Europe: The case of the VIBE project.* In 7th International Conference for Entrepreneurship, Innovation and Regional Development. Nicosia, Cyprus.

Solomon, A., Ketikidis, P. H., Choudhary, A., Baresel-Bofinger, A. (2014). *Drivers and Barriers to Green Freight Transportation: Industry evidence from UK and India.* In 18th Panhellenic Logistics Conference. Thessaloniki, Greece.

Baresel-Bofinger, A., Ketikidis, P.H., Koh, S.C.L., Cullen, J. (2011). *Role of 'green knowledge' in the environmental transformation of the supply chain: the case of Greek manufacturing*. International Journal of Knowledge-Based Development, 2(1), 107–128.

Baresel-Bofinger, A., Ketikidis, P.H., Koh, S.C.L., Cullen, J. (2011). *Green Innovation in Supply Chain Management – The Case of Greek Manufacturing*. In British Academy of Management Conference Proceedings 2011, Aston University, Birmingham, U.K..

Baresel-Bofinger, A., Ketikidis, P.H., Koh, S.C.L., Cullen, J. (2011). *Value Creation through Green Innovation in the Supply Chain: Evidence from Greek Manufacturers*. In Paper presented at the 6th SEE Doctoral Conference, SEERC, 19-20 September, Thessaloniki, Greece. (pp. 2–23).

Lazuras, L., Ketikidis, P.H, Baresel-Bofinger, A. (2011). *"Promoting Green Supply Chain Management:The role of the human factor"* 15th Panhellenic Logistics Conference and 1st Southeast European Congress on Supply Chain Management, 11-12 November, 2011 – Thessaloniki-Greece..

Baresel-Bofinger, A., Ketikidis, P.H. (2010). *Using Green Knowledge for Implementing Environmental Supply Chain Management Practices in Greek Manufacturers.* In Proceedings of the 5th International Forum on Knowledge Asset Dynamics (IFKAD 2010). Italy.

Baresel-Bofinger, A., Ketikidis, P.H., Koh, S.C.L., Cullen, J. (2007). *Innovative Measures for Green Supply Chain Management in South-east Europe.* In Proceedings of the 5th International Conference on Supply Chain Management and Information Systems 9-12 December 2007, Melbourne-Australia. Australia.

Baresel-Bofinger, A., Ketikidis, P.H., Koh, S.C.L., Cullen, J. (2007). *Implementation of Green Supply Chain Management in South-East Europe – A Literature Review.* In 4th BMBF Forum for Sustainability – German EU Council Presidency 2007: 'Sustainable Neighbourhood – from Lisbon to Leipzig through Research. Germany.

Baresel-Bofinger, A., Ketikidis, P.H., Koh, S.C.L., Cullen, J. (2006). *Implementation of Green Supply Chain Management in South-East Europe – A Literature Review*. In Proceedings of the 1st Annual SEERC Doctoral Student Conference (DSC 2006). Thessaloniki, Greece: South-East European Research Centre (SEERC).

Appendix H: Citation of Author's Papers

Scientific Journals

- Dube, A.S. and Gawande, R.R. (2016) 'ISM-fuzzy MICMAC approach for analysis of GSCM enablers.' *International Journal of Logistics Systems and Management*, 24 (4), pp.426 – 451, editor: Prof. A. Gunasekaran
- Golrizgashti, S. (2016) 'Effect of knowledge management on supply chain value, empirical evidence from Iran.' *International Journal of Business Performance and Supply Chain Modelling*, 8 (2), pp. 97 – 129.
- Ketikidis, P.H., Bulata, C. and Lazouras, L. (2012) 'Environmental Practices in the Romanian Banking Sector: An Exploratory Study', *The International Journal* of *Enterprise Network Management*, 5 (3), pp. 254-271.
- Ketikidis, P.H., Hayes, O.P., Lazuras, L., Gunasekaran, A. and Koh S.C. L. (2013) 'Environmental practices and performance and their relationships among Kosovo construction companies: a framework for analysis in transition economies.' *International Journal of Services and Operations Management*, 14 (1), pp. 115–130.
- Luthra, S., Garg, D. and Haleem, A. (2013) 'Identifying and ranking of strategies to implement green supply chain management in Indian manufacturing industry using Analytical Hierarchy Process.' *Journal of Industrial Engineering and Management***,** 6 (4), pp. 930-962.
- Tajbakhsh , A. and Elkafi Hassini, E. (2016) 'Performance measurement of sustainable supply chains: a review and research questions.' *International Journal of Productivity and Performance Management***,** 64 (6), pp. 744 – 783.
- Tan, K.H., Wong, W.P. and Chung, L., (2016) 'Information and Knowledge Leakage in Supply Chain.' *Information Systems Frontiers - A Journal of Research and Innovation*, 18 (3), pp. 621–638.

Theses

- Alatsakis, Michail (2013) 'Η δημιουργία και η εξέλιξη των συστημάτων Logistics - Creation and evolution of Logistics' T.E.I. of Crete, School of Management and Economics (SDO), Department of Accounting and Finance, Available from: https://apothesis.lib.teicrete.gr/bitstream/handle/11713/6507/AlatsakisMichail2013.pdf?sequence=1&isAllowed=y [Accessed 02 January 2017].
- Haag, Marina Ferreira Moreira (2015) "Green Supply Chain Management: uma relação com a visão estratégica de porter" Universidade Federal de Santa Catarina, Campus Joinville. Engenharia de Transportes e Logística Available from: https://repositorio.ufsc.br/xmlui/bitstream/handle/123456789/133861/tcc%20-%20corrigido.pdf?sequence=1&isAllowed=y [Accessed 04 January 2017].

- Solomon, Adrian (2016) ‘A Quintuple Helix Framework for the Implementation of Resilient and Green Road Freight Transportation in South East Europe’, PhD thesis, University of Sheffield. Available from: http://etheses.whiterose.ac.uk/14328/1/Adrian%20Solomon%20Full%20PhD%20Thesis%20V6.0_18_09_2016.pdf [Accessed 03 January 2017].