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List of abbreviations

AHP – Analytical Hierarchy Process

CO_2 – Carbon Dioxide

ECE – Environmentally Conscious Enterprise

ECP – Environmental Conscience Purchasing

EM – Expectation Maximization

EMS – Environmental Management System

EU – European Union

ISO - International Organization for Standardization

EMAS - Eco-Management and Audit Scheme

FSC – Forest Stewardship Council

GSCM/PMS - Green Supply Chain Management Performance Measurement System

HR – High Resilience

ICC– International Chamber of Commerce

I T – Information Technology

IUNC – International Union for Conservation of Nature

LED – Light Emitting Diode

MSR – Miljö Styrnings Rådet (Swedish Environmental Management Council)

NGO's – Non-Governmental Organization

PDCA – Plan-Do-Check-Act model

REACH - Registration, Evaluation, Authorisation and Restriction of CHemical substances

R & D – Research and Development

SPSS – Statistical Package for the Social Sciences

TDI - Toluene DIisocyanate

TQM – Total Quality Management

UCLA - University of California, Los Angeles

UN – United Nations

WWP – Världsnaturfonden (World Wide Fund for nature)

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Appendix

1 Introduction

This chapter contains a brief introduction into the thesis topic. A short background presents the increasing magnitude of the environmental concerns within business world. Greening the supply chain is already an actual challenge and the first step is towards the source – greening the purchasing process and including environmental criteria in supplier selection. The case company is introduced in the problem formulation paragraph followed by the purpose and research questions depiction. Furthermore, the delimitations, disposition and time-line of the paper are presented for a better understanding of the paper.

1.1 Background

The business world has reached the moment when the concerns for the environment cannot be anymore overlooked. The notion of environmental quality has *rooted* from the concepts of clean water and air to has developed to more advanced terms as: healthy ecosystems, Kyoto greenhouse emissions, natural resources and their waste, urban pollution, global climate change, etc (EU environment policy, 2008). These issues increase their amplitude each day and wake up the necessity to undertake appropriate and durable actions.

The consumption grows progressively and even more asks for customized and short lead-time products, thus stimulating the increased use of resources and further accumulation of waste. Globalization is an aspect that tremendously aggravates the situation of both the world economy and the environment. Buying and selling from any point of the globe implies immense transportation distances, large quantity-oriented supply, expensive informational systems, advanced technologies and equipment, facilities, increased human resources and other expenses that questions the concept of sustainable development that refers both to economic growth and to environment (Haines, 1998).

For this reason global business leaders endorse global environmental management programmes and adopt environmental mission statements (Russel, 1998). Already a big number of companies implement environmental management systems (e.g. EMS, ISO 14000) to address green issues and to demonstrate their social responsibility. However, we are yet at the very beginning of the road towards greening the economic environment since rethinking the way we do business includes changing cultures, industries, technologies, geographical locations and other rigid components.

1.2 Problem formulation

The majority of companies encounter now challenges due to ecological problems, social concerns and changes in consumer's attitude (Hutchison, 1998). Companies within supply chain are becoming more and more aware of the need for environmentally friendly products and truly eco supportive logistics. This is mainly because manufacturing and logistics activities are considered as the perpetrators in harming the environment, in the forms of waste generation, ecosystem disruption, and depletion of natural resources (Fiksel, 1996). The highest pressure falls upon the logistic function of a company as it incorporates the largest number of harmful activities regarding the ecosystem. Procurement is the first component of logistics and it seems to be the most overlooked when it comes to greening the logistic activities (Green, Morton & New, 1998). Recycling, reusing, waste management,

green transportation are known and broadly adopted in many companies while the procurement process remains hostile to environmental aspects. Greening the process of procurement improves the environmental aspects of other components of the logistics as it creates the basis and inputs for development of these components (Walton, Handfield & Melnyk, 1998; Ellram & Pearson, 1993; Preuss, 2005). Thus green procurement engenders a more efficient and easy way to deliver a product and enables companies to achieve green competitive advantage (Murphy & Poist, 2000; Zsidin & Hendrick, 1998).

Kinnarps is the number one company in Scandinavia and Europe's second largest supplier of workspace interior solutions, with approximately 200 showrooms all over Europe and around 2200 employees. It is represented in about 40 countries all over the world, the turnover is about 400 million Euros and the head office is located in Kinnarp, Sweden. Kinnarps was certified and worked in line with ISO 9001 and 14001 since 1997. Kinnarps is also EMAS-registered and publishes an annual environmental report on the environmental impact of its three factories. Despite that, ISO 14000 is not about being "green" (Hooper & Tromaras, 2009) rather is a code of controlling procedures and operations which encourage organizations to commit to environmental consciousness and obligations (Rezaee & Elam, 2000). Much criticism judge ISO 14001 for its considerable flexibility and a way to profit companies that certify. Thus it is relevant to judge EMS only by their effectiveness in delivering environmental commitment and achieving stakeholders' eco expectations.

The supplier selection and evaluation is a complex task which should root the organizational environmental performance and obviously should include environmental criteria. Kinnarps does not have a separate green purchasing policy; rather, it is consistent with the overall corporate environmental quality policy. The company sustains long term relationships with the most of suppliers, thus it is very interesting to depict and analyze the actual purchasing policy and to highlight the environmental criteria inserted in the supplier assessment. Furthermore, it is important to distinguish which environmental criteria are the most important for Kinnarps when evaluating its suppliers and if these criteria are as much important for the suppliers themselves. The modern research provides enough information to create an accurate environmental supplier evaluation model which will improve creation of greener products and will strength Kinnarps environmental position on the market.

1.3 Study Purpose

The *purpose* of this paper is to describe Kinnarps supply chain environmental management and to compare Kinnarps environmental expectations with suppliers' environmental attitude (Figure 1.1).

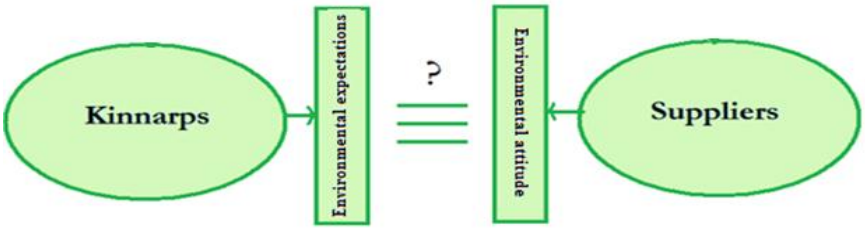

Figure 2.1 The congruency between Kinnarps environmental expectations and Suppliers' environmental attitude.

1.4 Research Questions:

In order to accomplish the purpose of this thesis we must undertake 4 research questions.

RQ1: What is the actual situation at Kinnarps in greening the supply chain?

This is a general question which cannot be overlooked because it speaks about the overall environmental awareness of Kinnarps regarding the supply chain in which it operates. The supply chain view may discover specific strengths or weaknesses, threats or opportunities for achievement of an environmental supplier evaluation. Here will be discussed green procurement component as the starting point in greening the supply chain and which contains supplier environmental evaluation as an absolute "must".

RQ2: How does Kinnarps evaluate its suppliers and which green criteria are included in this evaluation?

This question will try to reveal the present situation of the supplier evaluation model and distinguishes the environmental criteria that are included when evaluating or selecting a supplier. This is a qualitative answer regarding Kinnarps environmental expectations and awareness.

RQ3: What are Kinnarps' expectations regarding suppliers' green compliance and what is the actual suppliers' attitude regarding environmental issues?

The third question will be based on the results obtained from questioning Kinnarps and its supplier. It will support quantitatively the comparison between Kinnarps environmental expectations and its suppliers' environmental attitude.

RQ4: How can be suppliers clustered according to their environmental attitude?

The last research question will discover a specific clustering of Kinnarps suppliers based on their environmental attitude extracted from questionnaire results.

1.5 Delimitations

The case study is based on a single company so it cannot be generalized for other companies. Also it focuses on a company within furniture industry and cannot be seen as a general outline for other industries. However it presents a good example for practitioners and scholars by illuminating the green practices in Kinnarps Company.

1.6 Definitions

Green supply chain management = the process of including environmental concerns into the management of supply chain.

Green procurement = adoption of green policies in purchasing strategies.

Supplier environmental selection = potential supplier selection according to environmental criteria.

Supplier environmental evaluation = a process of evaluation the present supplier environmental performance which can be part of the supplier environmental selection.

1.7 Time schedule

Time line for executing this thesis was delimitated by 11 tasks (Table 1.1) which usually had overlapped each other in order to adapt and improve the context. The thesis research starts in week nr. 3 on the 20th of January and finishes on week 20 on 21st of May.

Table 1.2 Gantt chart for executing the thesis research

NR.	Task/ Week NR	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Topic choice																		
2	Company interview I																		
3	Introduction part																		
4	Theoretical part																		
5	Questionnaire creation																		
6	Company interview II																		
7	Questionnaire collection																		
8	Empirical part																		
9	Analysis part																		
10	Conclusion																		
11	Final revision																		

1.8 Disposition

For a better understanding of the structure and aim of this paper the authors present the disposition of the thesis (Figure 1.2). The paper starts with the introduction. It contains a short background on the topic, problem discussion, the research purpose and research questions, delimitations and disposition. The second chapter will discuss the theory used in this study and will construct the conceptual framework. The methodology will be described in the third chapter. The next chapter will present the findings of empirical data gathered for this research. The analysis of the data will be presented in the fifth chapter. In the final chapter the findings will be summarized in a conclusion and further research will be recommended.

Figure 3.2 Disposition of the thesis research.

2 Theoretical framework

This chapter develops a literature research on theories related to the thesis topic – environmental supplier selection. This is the main component in achieving green procurement which in its turn is a major component in developing a green supply chain management. Thus it is vital to start creating the theoretical framework gradually narrowing from green supply chain management to green procurement and finally to green supplier evaluation. A framework of green criteria for supplier environmental evaluation summarizes the previous research.

2.1 Green Supply Chain Management

The supply chain has been traditionally defined as a one way product flow system. Where raw materials are converted into products and then delivered to the customers. A traditional supply chain can be measured by the performances in costs or customer satisfaction. But, due to recent changing environmental requirement both from the final customers and legal entities the concept of greening supply chain has been growing fast. One of the basic reasons why to invest in greening the supply chain is the resource savings, waste elimination and improved productivity. Over years this will result in improved both business processes and environment. Moreover, the greening concept creates not only improved efficiency but also can drive to new product innovations and bigger market coverage. Hervani, Helms & Sarkis (2005) defines Green Supply Chain Management as:

Green Supply Chain Management= Green purchasing + Green Manufacturing/Materials Management + Green Distribution/Marketing + Reverse Logistics.

Reverse logistics is closing the loop of a typical supply chain and includes reuse, remanufacturing or/and recycling of material into new materials or other products with value in market.

Beamon (1999) tried to design the figure of an extended supply chain (Figure 2.2) by having the model of the traditional supply chain figure (Figure 2.1).

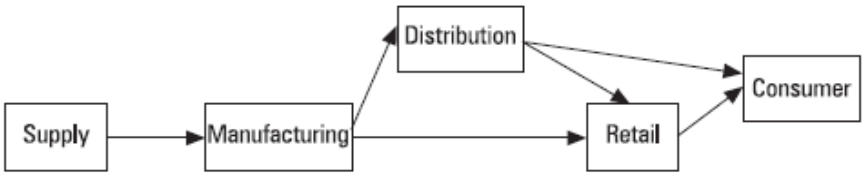

Figure 2.1 The traditional supply chain (Beamon, 1999).

The extended supply chain contains all the elements of the traditional supply chain (supply, manufacturing, distribution and delivery), but it contains a semi-closed loop that includes product and packaging recycling, re-use or/and remanufacturing operations. The links in the figure 2.1 represent the extended supply chain and the "W"s enclosed in diamonds represent waste or deposed materials.

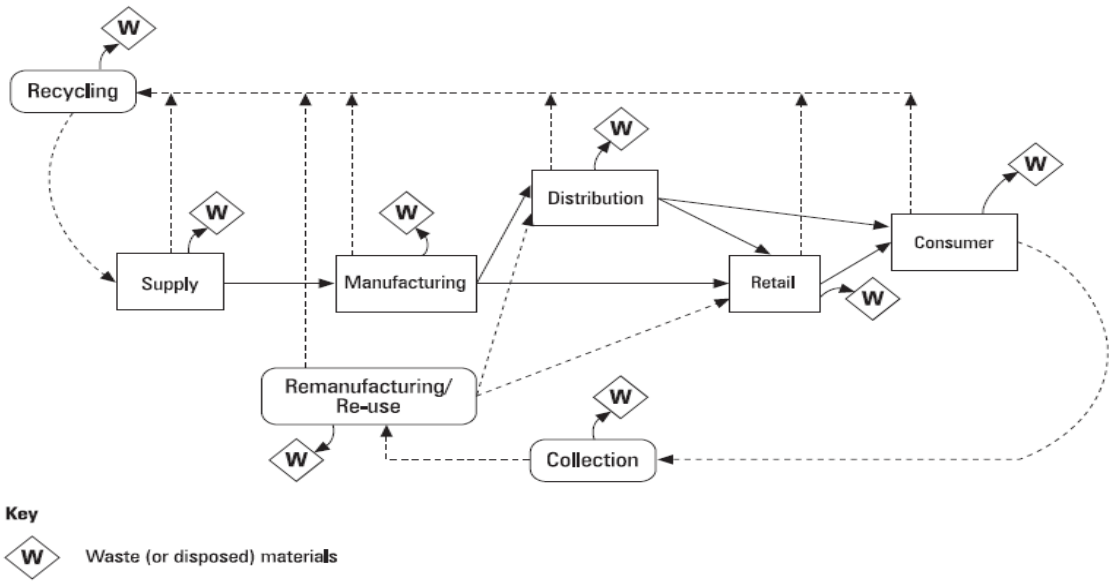

Figure 2.2 The extended supply chain (Beamon, 1999).

In the past there have been some efforts from organizations to come with a set of environmental principles on eco-efficiency like: Cleaner Production Programme and the Valdez Principles (Tsoulfas & Papis, 2006). Moreover, Environmental Management Systems (EMS) such as ISO 14000 and EMAS come to provide a structured approach to plan and implement environmental measures in the companies. Tsoulfas & Papis (2006) try to change the descriptive principles provided by EMS and presents a prescriptive approach of the principles. As authors presents environmental principles of the supply chain design can be classified in six groups: product design, packaging, collection and transportation, recycling and disposal, greening the internal and external business environment and other management issues.

Product design refers to design of recoverable product, technically durable, repeatedly useable, harmlessly recoverable after use and environmentally compatible in disposal. The product must use minimum energy and materials, with a priority in usage for secondary raw materials, using eco-friendly energy production, reduce water usage etc. *Packaging* refers to limit the packaging by redesign, reuse or recycling. *Collection and transportation* refers to the necessity to develop a policy of recovering the used materials, maximum usage of load capacity, minimizing the transportation distance and the use of supply chain facilities for reverse logistics. *Recycling and disposal* refers to effective and efficient recycling, considering the alternative use of used products or wastes. Build recycle facilities close to the customer and develop markets for recovered materials and components. *Greening the internal and external business environment* refers to management practices. Supply relationships are the key to built sustainable products. Higher standards on suppliers and a closer cooperation, sharing the product information concerning recycling and reuse materials, motivate customers that are buying green products and introducing eco-objectives to the employees are only few activities that refer to management implication in greening the supply chain. *Other management issues* reflects strategic policies that apply to the whole supply chain like establishing flexible manufacturing, efficient accounting systems and management tools, "smarter" manufacturing (shift from supply driven economy to demand driven economy).

Kopicki, Berg, Legg, Dasappa & Magioni (1993) suggest three different approaches in environmental management depending on the implication of the company to implement green policies: reactive, proactive and value seeking approach. In the reactive approach

companies are characterized by using minimal resources to develop a green policy. Some actions taken by those companies are: procurement of some products with some recycling content, start labeling products that are recyclable and use filters to lower environmental impact of production lines. In the proactive approach companies try to take a step in advance than environmental legislation by recycling of the products and designing new green products. The term of re-use and recycle are becoming an important element for company's environmental management. The highest level is value-seeking approach, the environmental activities became a part of the business strategy of the company and the firm operates to reduce its impact on the environment as a strategic initiative. Designing and re-designing of the products for disassembly, the use of life cycle analysis and creating an involvement on the third parties are few of the main activities that describes a value-seeking approach company. Walton et al. (1998) extends the framework purposed by Kopicki et al. (1993) and states that companies will succeed to become value-seeking if all the actors in the supply chain will act as a whole system, by jointly developing an environmental management process. Then the impact will be leveraged through the chain and expanding to other chains.

Van Hoek (1999) comes with green steps to implement. First, should be created a marketing edge by using green concept as a unique selling point with environmental conscious customers. Second, leveraging innovation – designing smart products that are easier to disassemble and lower assembling lead time. And the third, realizing cost-savings thorough resource savings - less fuel to transport as an example. Becoming a green supply chain is proved to lead to sustainable advantages but, yet, it depends on the type of the product, the availability of environmental knowledge and on the cost of the change program (Walton et al, 1998; Preuss, 2005).

An example of a perfect green supply is an industrial ecosystem. The companies within this network use the waste of each other and minimize the use of natural resources. Such ecosystem exists in Kalundborg, Denmark, and comprises a power plant, an enzyme plant, a refinery, a chemical plant, a cement plant, a wallboard plant and some farms (Tibbs, 1993). All companies coordinate the consumption of water, energy, raw materials and waste. Here the green purchase strategy was determined initially by allowing distinct companies to enter the eco-network.

Van Hoek (1999) purposed a table that describes the green activities that need to be performed by supply chain players. Table 2.1 is an attempt to redefine the context and scope of the green initiatives in the supply chain, from the upstream to downstream players.

Table 2.1 Players, activities and evaluation of greening efforts throughout the supply chain (Van Hoek R.I., 1999)

	Upstream	Midstream	Downstream
Players	Raw materials suppliers Parts suppliers	Main suppliers Manufacturers	Wholesalers Importers/distributors Retailers
Green activities	Material selection Re-use of materials	(Design for) dis-assembly Scrap, shred Transportation	Packaging Returns handling Returns shipment
Relation performance measures	Emission rates and energy efficiency per material % of virgin material	Volume of goods dis-assembled per hour Degree of utilization transport equipment	Amount of "air" in package Volume selected for recycling

How to measure the performance of the green supply chain is a hot topic in nowadays research different measurement systems are elaborated both by organizations and companies. ISO 14031 is the standard that presents the guidelines for measuring environmental performances but not a standard for certification. ISO 14031 is designed by using the Plan-Do-Check-Act (PDCA) model for implementing an environmental management system and is a part of continuous improvement aspects of the quality management. ISO 14031 evaluates the performance of the environmental indicators in three key areas: environmental condition, operational performance and management performance. Hervani et al. (2005) designed the foundation of the Green Supply Chain Management Performance Measurement System (GSCM/PMS) using the ISO 14031 guidelines. The document focuses on planning, applying, describing, reviewing and improving environmental performance assessment with guidance from the process of collecting, analyzing and communicating data.

The model comes to help the companies to improve their environmental policies. The result of Green Supply Chain Management Performance Measurement System (GSCM/PMS) can be used to serve numerous purposes including external communications, internal improvements, and regulatory compliance. Metrics and longitudinal data will be available to benchmark and show performance and improvement over time in environmental. The GSCM/PMS may be the source of the data to send the message of change toward more environmental actions. The GSCM/PMS data may also be used internally for assessing progress in waste elimination, recovery, recycling, cost containment, elimination of extra processing time and other measures of waste. This model will also help companies to achieve ISO 14000 requirement. On the other side implementing this model could be costly for the companies, which will mitigate the willingness of the companies to implement such an environmental performance measurement system (Hervani et al. 2005).

Unmistakably, the present supply chains relate their sustainability to the supply chain integration. The more integrated is the supply chain the more sustainability it engenders. Vachon & Klassen (2006) argue that a supply chain green practices are affected by the integration level. They delimitate two components of green practices as environmental collaboration and monitoring and suggest that a more integrated logistics decreases the environmental monitoring activities and consequently increases the environmental collaboration. As such a lower environmental monitoring of the supplier can impact negatively or decrease the optimal green procurement decision

The supply chain concept had changed its scope to a more complex one and technically we should speak about networks (MacBeth, 2009). Purchasing, production and delivery are becoming similarly more complex due to globalization, newly developing countries (e.g. China, India) and due to new requirement both from customers and regulatory institutions regarding environmental change. Therefore is necessary to implement policies and models that will help companies alone and supply chains as a whole to integrate them into new regulations and customer demands. Development of new products, improvement of environmental aspects inside and outside company and developing new corporative environmental policies are steps that needs to be taken into account by companies in order to become competitive while accomplishing sustainable processes.

"There is much more to greening than the reverse flow of goods only" is a statement from Van Hoek (1999), who had analyzed the concept of greening the supply chain from the perspective of transition from reverse logistics to a green supply chain. Purchasing of raw

materials initiates the supply chain operations, thus greening should start with greening the source.

2.1.1 Managerial Green Implications

Environmental concerns occur as a result of human careless activity and the burden to correct and straighten the corporate goals towards environmental consciousness resides also on the human shoulders. In the context of greening the supply chain at its very roots – at procurement level, the lumber falls upon the responsibilities of purchasing managers. One of the definitions suggests that "purchasing managers are those who plan, organize, direct, control and evaluate the activities of a purchasing department and develop and implement purchasing policies of a business" (National Occupational Classification, 2001). This implies how important these managers in addressing environmental issues are. The problem is that actually the managers are the main barriers towards greening (Preuss, 2005). Environmental initiatives require new forms of knowledge, skills, and competencies among purchasing managers. In fact, daily efforts of purchasers are focused on creating efficient ways to ensure various supplies at lowest possible price and not spending money on more expensive products which can carry eco strengths (Birett, 1998). Many of them do not have the authority and power to initiate green purchasing policies and neither the time and resources to explore the benefits of such green supplies.

A research made by Bowen, Cousins & Lamming (2001) among purchasing managers reveals that 60 % of respondents strongly agree that their organization should share the environmental impact produced by their suppliers. However, green purchases are seen by many managers not as much for philanthropic reasons but rather because of cost reasons, which means some green products are cheaper. Moreover, many managers consider that environmental concerns should not bother them personally because of the position they occupy in the organization and, in case, their institution deliver non-environmental friendly products, than there will always be found a solution from technical point of view to control the safety of these products (Fineman, 1997). Thus, in addition to the limited power managers have, personal attitudes that oppose greening the purchasing process or they consider fair to pass it to the other departments like health and safety. Another managerial challenge is decentralization of purchasing activities. This requires greater efforts to co-ordinate communicate and monitor the procurement of green items (Birett, 1998).

Preuss (2005) describes the various influences on purchasing managers and highlights 5 constraints on purchasing decision- making:

1) Internal: general criteria specified by senior management;
2) Internal: detailed criteria required by specific departments;
3) External: legal regulations;
4) External: customer defined criteria
5) External: competitor induced criteria

These constraints reveal the complexity of decision making for purchasing managers. Much of these constrains focus directly on performance criteria, thus less attention is paid to include the environmental criteria in purchasing decisions.

Therefore the increased environmental awareness of purchasing managers is an essential prerequisite for greening procurement and the whole supply chain. Legal regulations regarding environment, customer eco-demands, competitor's green image and other factor stimulate the environmental performance of purchasers, but still, the major impact relies on the personal education and attitude of the purchasing managers towards environment.

2.1.2 Green Procurement

The process of greening the supply chain begins, obviously, with the suppliers whose practice and products must become environmentally friendly. Thus, procurement of eco materials is the starting stage for manufacturing green products within a supply chain (Huang & Keskar, 2007). Russel (1998) defines green procurement as the integration of environmental considerations into purchasing policies, standards (i.e. ISO 14000 series) and actions. Furthermore, green procurement is directly connected to supplier's product aspects related to eco-label, energy use, recyclability, re-usability, use of environmental management systems (EMS), use of harmful substances, product lifecycle and other processes that support the product creation (Nagel, 2003).

The first green procurement initiatives emerged in the public organizations in 1980s, 1990s (Erdmenger, Eri, Fuhr, Lackner, Schmid & van der Grijp, 2001) and today in EU, a survey has estimated up to 85 % public respondents that involve environmental consideration into their procurement process (Ochoa & Erdmenger, 2003).

Private organizations are less responsive to the environmental issues, except those influenced by stakeholders, NGOs and government. Min & Galle (2001) found that the larger company is the bigger probability that it will adopt green procurement strategies. Moreover, the firms that engage more seriously in the environmental regulations are more likely to adopt green supplier selection. However, green criteria are rarely incorporated in purchasing decisions, unless there are clearly defined benefits for the buyer or there are strict governmental regulations (Porter & van der Linde, 1995). Environmental regulations enhance and force the eco-conscience of manufacturers, who, in order to find eco-alternatives for the materials that do not meet environmental criteria, initiate even suppliers' environmental design (Design for Environment, 2010).

For those companies that green purchase is recognized as a tool for elimination waste, the achievement of competitive advantages is more like to occur due to lower costs and higher social responsibility. As such, a special learning system is necessary to educate and train the employees who will deal with recycling and reusability of the materials and products. Furthermore, Shrivastava (1995) proposes a combination of total quality environmental management and ecological sustainable competitive strategies. This approach would work like a normal TQM system striving for general production efficiency, including supplier monitoring, but additionally would consider the energy and materials conservation, larger use of reusable/renewable materials, ecological purchasing policies and monitoring systems. Preuss (2002), also, argues that the green change will trigger organizational and hierarchical changes and managers should obtain more power on deciding the corporate strategic issues.

We may say that green procurement policies take part in the achievement of sustainable competitive advantages due to total quality environmental management which includes lean management, process innovation, reusability, renewability, recycling, energy and resource savings. The question is upon what is understood by "sustainability" since there is no consensus upon this term (Green et al., 1998), as well as common performance metrics for sustainable supply chains since the evaluation must take into account not only "hard" financial data but also "softer" data related to environment (Preuss, 2002).

There are many barriers for green purchase, such as non availability of the green products, lack of knowledge, fear of appearance of increased costs and limitations to the project (Varnäs, Balfors & Faith-Ell, 2009) which should be debated and confronted. Thus the

challenge is to find green suppliers, to evaluate and select the most suitable and more important is to define the right environmental criteria when assessing a supplier.

2.2 Supplier selection and evaluation – the essential component of green procurement.

Supplier selection is the basic component of green procurement. Finding the green source becomes much more problematic because of the environmental consideration and more important for further green performance. Investigations has shown that suppliers are becoming increasingly critical for the competitive success of the firm (Handfield & Pannesi, 1995) and purchasing managers are the key personnel in strategic sourcing and in advancing environmental biding in supplier selection (Zhu & Geng, 2001).
Noci (1997) distinguish two types of environmental purchasing strategies: reactive and pro-active environmental strategies. These strategies imply different environmental evaluation criteria of suppliers (figure 2.3).

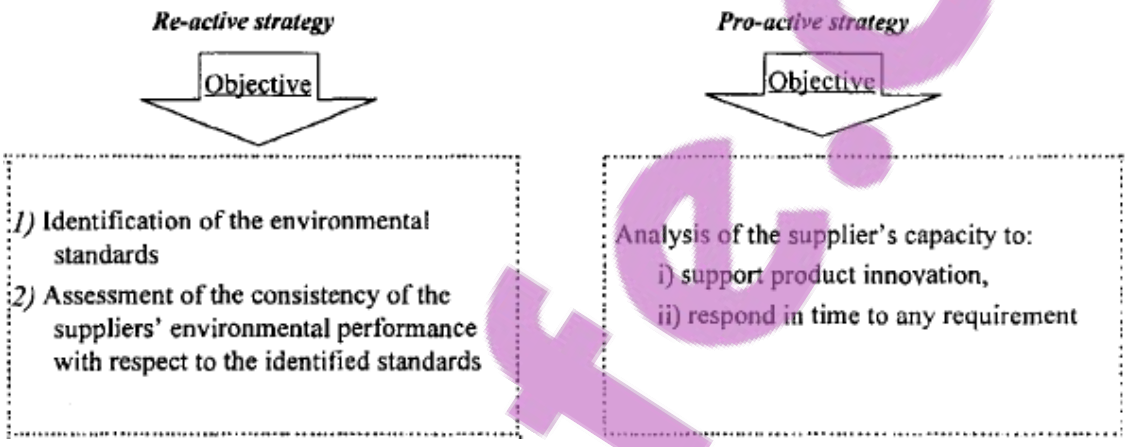

Figure 2.3 Identifying the influence of corporate green strategy on the supplier selection procedure (Source: Noci et al., 1997).

For a better understanding of the concept of environmental supplier selection it is valuable to start with some words about the traditional supplier selection process.

2.2.1 Traditional supplier evaluation

Supplier selection is a process of selecting key suppliers based on a pre established set of criteria; it is a useful and an objective way of choosing the right partners to get in supply chain relationships. A company can employ standardized selection criteria or any criteria arising from its core processes requirements. Standard selection criteria generally aim to cover issues such as quality, financial capacity, services and equipments, quantity, responsiveness, and others. The research on supplier selection is countless, first, because of the crucial role that this process plays in supply chain management and secondly, because of the major developments that had impacted this process (De Boer, Labro & Morlacchi, 2001).

The former studies in supplier selection field can be found around '60s and, until now, dozens of useful methods have been exposed by scholars: matrix method (Gregory, 1986), Vendor Profile Analysis (Thompson, 1990), categorical method (Timmerman, 1986) Analytical Hierarchy Process approach (Saaty, 1980; Nydick & Hill, 1992), multi attribute utility (Min, 1993), etc. The traditional supplier selection criteria were based on the habitual

factors such as costs, quality, lead-time, flexibility, contained in the Standardized selection concept.

Lee, Kang, Hsu & Hung (2009) made a comprehensive research of all supplier evaluation criteria and developed one table that comprises the main traditional components (table2.2). We can notice from the table 2.2, the environmental aspects included in the traditional supplier selection process are very superficial, general and do not really speak about the supplier green compliance. The accent is put on quality, finance and organization while the environmental concerns rest at the bottom of the criteria list.

Table 2.2 Criteria and sub-criteria for evaluating suppliers (Source: Lee et al, 2009)

Criteria	Sub-criteria
Quality	Quality-related certificates
	Capability of quality management
	Capability of handling abnormal quality
Finance	Past finance performance
	Stability of finance
	Price
Organization	Attitudes of managers
	Future strategy direction
	Degree of strategic cooperation
Technology capability	Capacity
	Technology level
	Capability of R&D
	Capability of design
	Capability of preventing pollution
Service	Credible delivery
	Capability of delivery on time
	Capability of technology support
	Flexibility
Total product life cycle cost	Cost of supplied components
Green image	Green purchase trend of customers
Pollution control	Use of harmful materials
Environment management	Environment-related certificates
	Internal control process

2.2.2 Green supplier evaluation

Integrating environmental criteria in supplier selection increases the complexity of supplier evaluation. This situation is depicted in the De Boer et al. (2001) study where the authors illustrate the impact of contemporary development on purchasing decisions (Figure 2.4).

As such, in addition to globalization, outsourcing, internet and government, environmental concerns are other factors that influence the purchasing decisions and raise the need to improve the traditional criteria of suppliers' evaluation by adding more detailed green criteria.

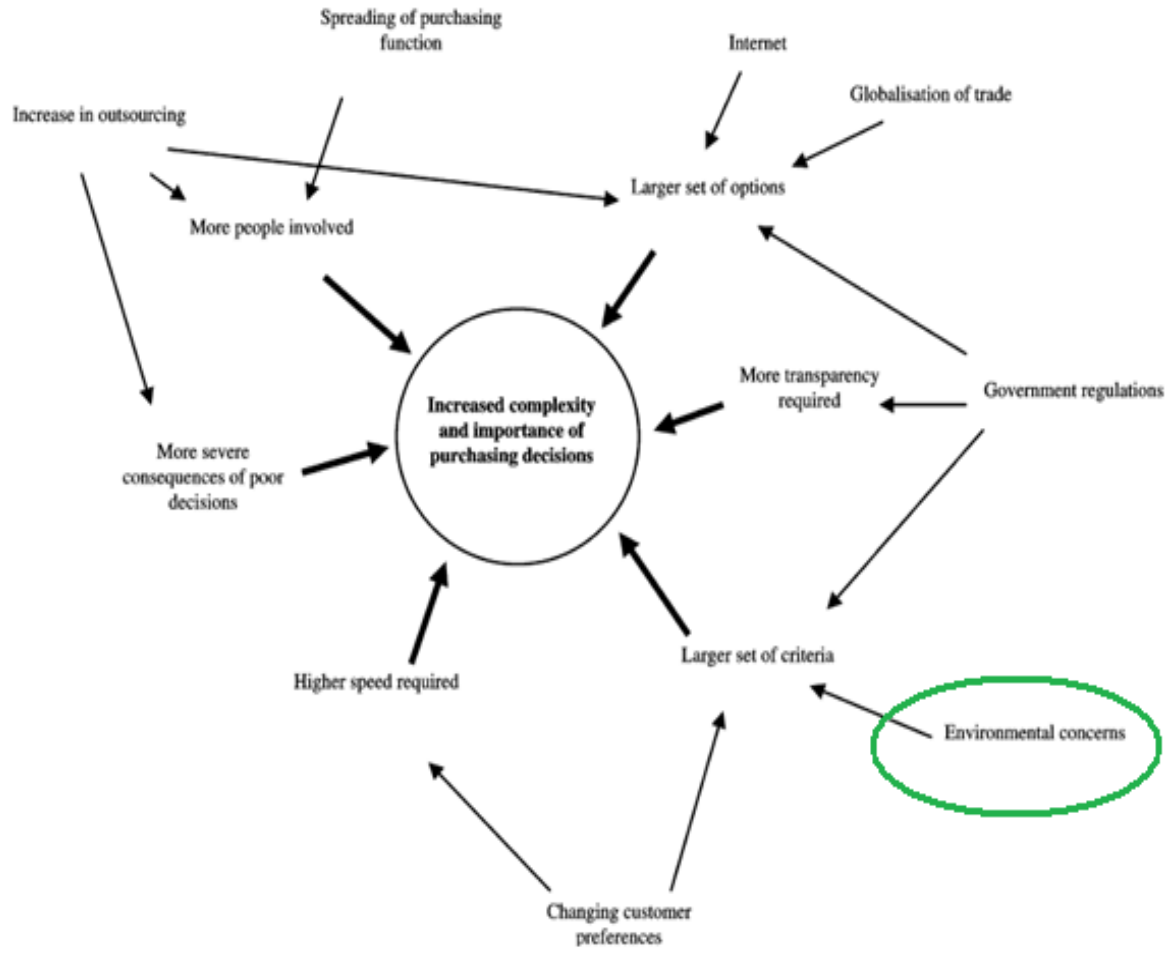

Figure 2.4 The impact of development on complexity of initial purchasing decisions (de Boer et al., 1998).

The obvious necessity to add green criteria has triggered many scholars to initiated research studies. Even if studies on environmental green supplier evaluations were made not so many, there can be found impressive researches that strive to include as relevant as possible the eco criteria in green procurement. Our paper will present *five remarkable researches* conducted by Noci, (1997), Enarsson (1998), Handfield, Walton, Sroufe & Melnyk (2002), Humphreys, Wong & Chan (2003) and Lee et al. (2009) that caught our attention due to the relevance of the information to our topic.

The earliest study from our list was made by Noci (1997) who made a significant attempt in this field. First he differentiates the two above mentioned green corporate strategies (figure 2.3) and accordingly elaborates the evaluating criteria. Companies which adopt reactive approaches to the environmental issues must evaluate the suppliers' current environmental efficiency and net life cycle cost. However, companies that aim to address pro-actively the environmental concerns should add to these two also the assessment of suppliers' green competencies and their green image (figure 2.5). All this criteria are qualitative and can be expressed both in quantitative and qualitative terms depending on the strategy.

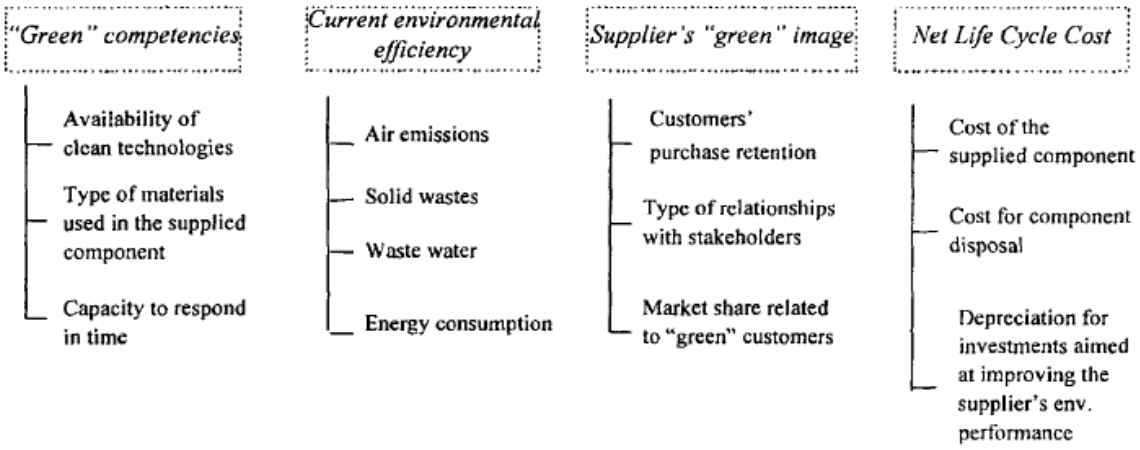

Figure 2.5 Qualitative evaluation criteria for proactive strategies (Noci, 1997).

Also in 1997, the Swedish scholar, Enarsson developed an amazingly comprehensive supplier environmental evaluation model made by using Ishikawa cause-effect diagram.

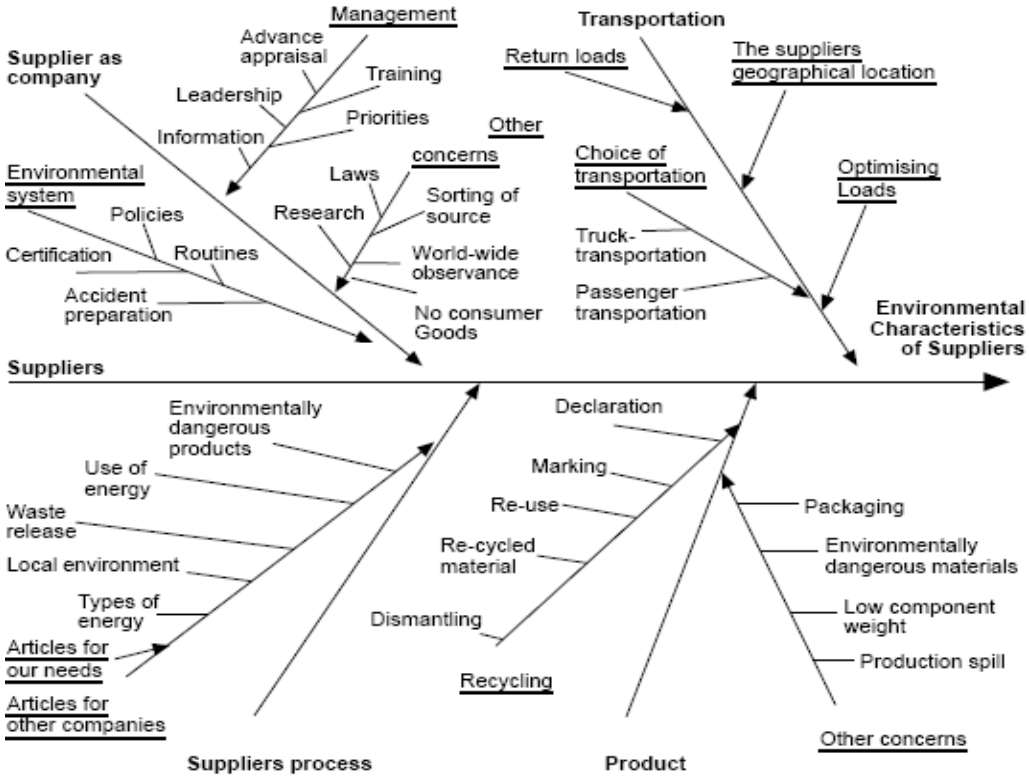

Figure 2.6 Proposed method of evaluating supplies from an environmental perspective using Ishikawa's fishbone diagram (Enarsson, 1997).

The fishbone diagram (figure 2.6) highlights a single problem (i.e. environmental characteristics of the suppliers) and the reasons for this problem. The reasons are depicted through four main perspectives: the supplier as a company, the supplier's process, the product itself and the transportation. These factors raise the questions first upon how green the organization of the company is, secondly, how ecological the activities and processes that take part in the company are , then, how the product is adapted to the environment and latest how environmentally-friendly the transportation is. This model is a

tool to evaluate the suppliers' environmental status and a system that offers the suppliers the possibility to evaluate their selves and to take appropriate measures. The choice of parameters where based on the ICC's principles and on the opinion of managers from three big Swedish companies. Since the valuation differs depending on the supplier, the Ishikawa parameters were adjusted with different standard deviation suggested by managers.

Another attempt to integrate the green criteria into supplier selection has been made by Handfield et al. (2002). They have introduced the concept of Environmental Conscience Purchasing (ECP) as a main component of the Environmentally Conscious Enterprise (ECE) and created the supplier evaluation model based on the Saaty's AHP model (1990).

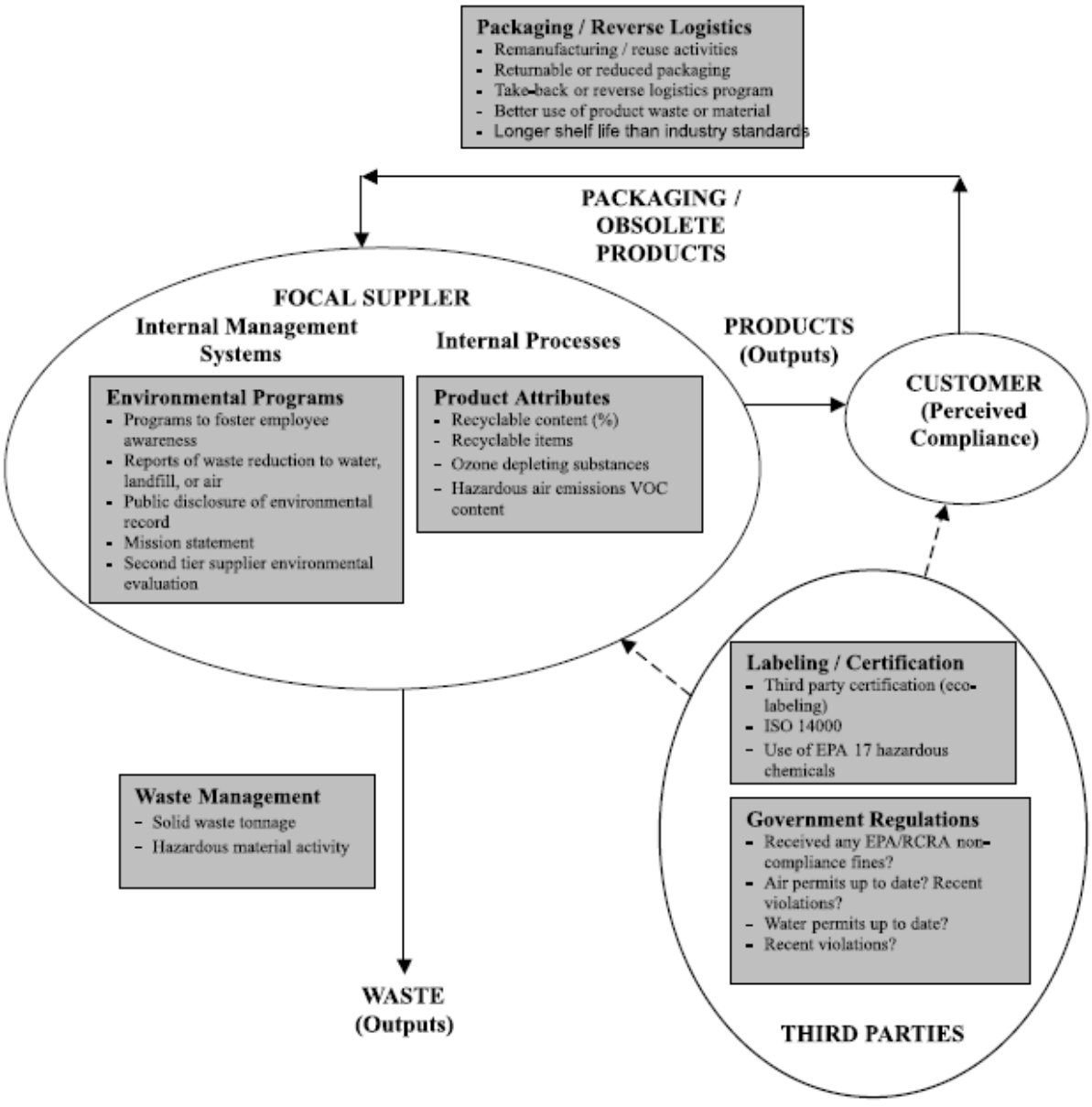

Figure 2.7 Framework for environmental performance attributes used in AHP model (Handfield et al., 2002).

AHP is a benefit measurement (scoring) model based on subjective managerial inputs on multiple criteria. The managerial inputs have been acquired through the Delphi Group method and embraced managers from several companies from Fortune 500. The results

from Delphi Group were used to create a model that would refine and consolidate the criteria set and would include those that could be easily assessed and were important from an environmental point of view. Figure 2.7 represents the environmental performance attributes that are important in supplier – customer relationship and these attributes: Product attributes, Waste management, Labeling/certification, Packaging/reverse logistics, Compliance to Government Regulations and Environmental Programs at the supplier's facilities – should be included in supplier environmental assessment.

Humphreys et al. (2003) elaborated another ample research regarding including the environmental criteria in supplier selection. Their environmental framework (figure 2.8)consists of quantitative criteria (environmental costs), which are pollutant costs and environmental improvement costs, and qualitative criteria which comprise management competencies, green image, design for environment, environmental management systems and environmental competencies.

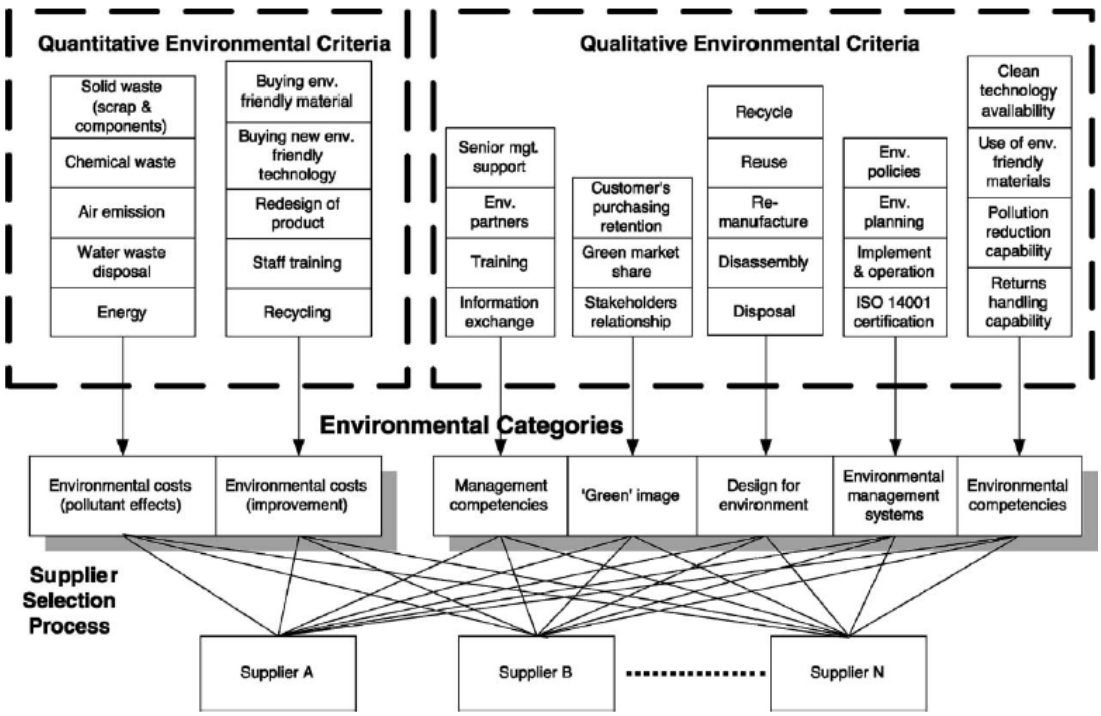

Figure 2.8 Environmental framework for incorporating environmental criteria into the supplier selection process (Humphreys et al., 2003).

Furthermore, they developed a knowledge base system that engages 6 stages:

1. Proactive or reactive environmental strategy analysis (Noci, 1997)
2. Checking suppliers environmental legal compliance;
3. Quantitative analysis;
4. Comparison of quantitative results for further proceeding;
5. Identification and weighting the qualitative criteria;
6. Qualitative comparison and final evaluation.

This approach is much similar to Noci's (1997) method but it is more detailed and sophisticated. Jabbour & Jabbour (2009) have used these environmental criteria to develop a case study in Brazil and they have stated that none of the studied companies include such environmental criteria in their supplier evaluation process.

The latest study was conducted by Lee et al. (2009). They had developed a second table (table 2.2) that integrates the eco criteria into the traditional criteria table (tabel.2.3)

Table 2.3 Criteria and sub-criteria for evaluating green supplier (Source: Lee et al., 2009)

Criteria	Sub-criteria
Quality	Quality-related certificates
	Capability of quality management
	Capability of handling abnormal quality
Technology capability	Technology level
	Capability of R&D
	Capability of design
	Capability of preventing pollution
Total product life cycle cost	Cost of component disposal
Green image	Ratio of green customers to total customers
	Social responsibility
Pollution control	Air emissions
	Waste water
	Solid wastes
	Energy consumption
	Use of harmful materials
Environment management	Environment-related certificates
	Continuous monitoring and regulatory compliance
	Green process planning
	Internal control process
Green product	Recycle
	Green packaging
Green competencies	Materials used in the supplied components that reduce the impact on natural resources
	Ability to alter process and product for reducing the impact on natural resources

Authors had added green criteria related to the green product, green competencies and product life cycle and also had developed the pollution control, environmental management and green image with more sub-criteria and eliminated the traditional finance and organization criteria. The reason why the cost is not included is basically due to the fact that only suppliers that can face the cost requirement are assented to participate in the process of green evaluation.

The environmental awareness has directed many researches towards including the environmental criteria in supplier selection and evaluation. Still, there are many barriers in applying these criteria to specific companies within specific business fields and in specific supply chains. It is very important to align the buyers green requirements with the suppliers green attitude when both selecting for the first time a supplier and assessing an old supplier. Thus it is crucial to select the right environmental criteria or to combine the relevant criteria from the amalgam of methods and to create an environmental supplier selection method that fits the company profile.

2.3 Conceptual framework "Environmental pyramid"

The five models presented above have many similarities and overlaps when it comes to inserting the environmental criteria in supplier selections (e.g. green image, green competencies, pollution control, EMS, etc). However, each of the models is distinct regarding its criteria representation and organization. Therefore, the authors had constructed a conceptual framework of these concepts which will summarize and organize the criteria. The framework was named as "Environmental pyramid" (Figure 2.10) due to the way it organizes the green criteria for supplier evaluation. The pyramid is delimited into four major building blocks of environmental criteria, namely: Environmentally-oriented Management and Company, Environmental Product Design, Environmental Competencies and Environmental Management Systems and Environmental Compliance.

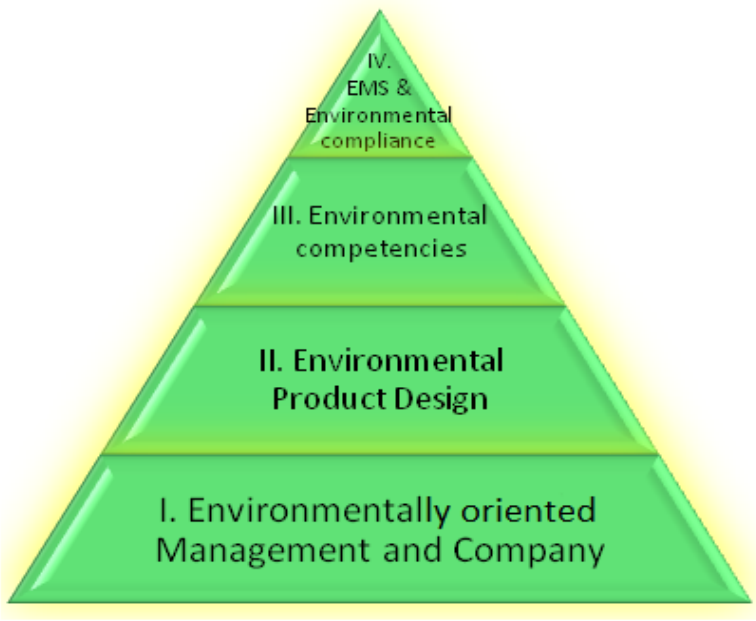

Figure 2.9 "Environmental Pyramid" – conceptual framework of the supplier environmental evaluation.

Further will be developed these four building blocks of the ¨Environmental Pyramid¨ and highlighted the environmental criteria that each of them includes (figure 2.10).

2.3.1 Environmentally oriented management and company

First block brings the criteria related to the management and organization itself. This block is the foundation of the pyramid and it highlights the major role of senior management and operational mangers in fighting environmental issues. Thus it strives to discover the awareness of purchasing, production, logistics managers to operate environmentally friendly and also the presence of senior management environmental support. Furthermore, the foundation block questions the green image of the company on the market and company proximity to buyer or possibility to locate closer. The last criterion included in this block speaks about the availability of environmental information, interest to share it and existence of environmental trainings. Meeting the environmental criteria from this block is crucial for achieving the following building blocks and first of all it triggers environmental design of products which is part of the second block.

2.3.2 Environmental Product Design

The second building block of the pyramid relates to the environmental aspects of the product. Thus we can distinguish 6 major aspects which reveal the environmental design of products:

- Product re-usability – possibility to reuse items as much as possible before replacing them;
- Product recyclability – to ensure that items or their components are put to some new purpose as much as possible;
- Possibility to re-manufacture the product;
- Possibility to easily disassemble the product;
- Product disposability – capability to be thrown away without harming the environment.
- Product durability - designed to last as long as possible.

All these aspects refer to how environmentally friendly is designed a product thus it is very important to evaluate their presence.

2.3.3 Environmental Competencies

After designing the product environmentally friendly the focus is transferred to what green methods, techniques, tools and routines for building the green products should be applied. The third block comes to evaluate these environmental competencies of the supplier to produce and deliver green products. Thus the pollution control, energy, material and water consumption reveals the manufacture greenness while the choice of transportation, load optimization and return load capability ensures a greener delivery of products. All these competencies rely on the organizational capability to develop new technologies, to redesign and conduct other researches aiming for environmental improvements.

2.3.4 EMS and Environmental compliance

The last building block of the supplier evaluation pyramid validates the environmental certification and regulatory compliance of suppliers and also checks for the presence of environmental process planning, monitoring and control. At this stage is important to question if suppliers have green procurement standards and if they include environmental criteria in the evaluation of their own supplier, if any. It is important to mention that the last bock is like a hood that is build only on the achievements of prior blocks and is itself an evaluation of the environmental achievements.

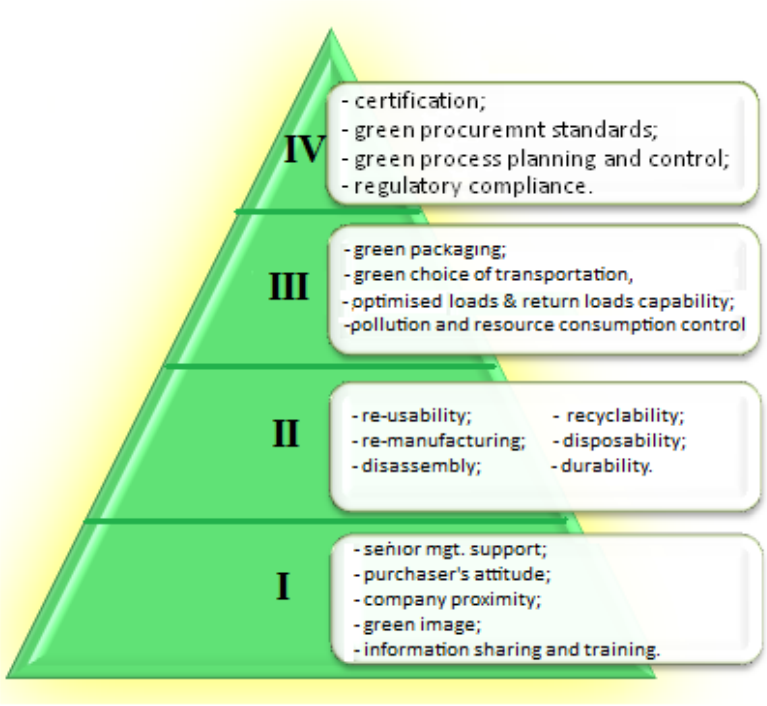

Figure 2.10 Environmental criteria for supplier evaluation pyramid.

The pyramid model provides us with a summarized framework of green supplier evaluation criteria built up in four blocks. Another summarized literature table can be found in the Appendix 1. It includes the main scholars that are regarded in this paper and also their theoretical contribution.

3 Methodology

In this chapter the authors will present and discuss the methods used to achieve the purpose of the thesis. Each research question will have a different approach and data gathering method to analyze them a methodological framework was drawn to present the structure of the chapter.

3.1 Research Strategy

According to Yin (2003a), five main research strategies can be indentified: experiments, surveys, archival analysis, histories and case studies. If the research must answer the questions as: *who, what, where, how much and how many* – then the research strategy must be based on survey and archival analysis, but if the research is answering questions as: *how* and *why* – then the research strategy must be conducted via experiments, history and case study.

In our study the authors will analyze *how* Kinnarps is implementing green policies in its supply chain. *Why* Kinnarps is paying so much attention on greening. *How* Kinnarps is evaluating and selecting suppliers in respect to environmental issues, which criteria are used. Consequently a case study approach is preferred to conduct this research paper. In order to narrow the research and to answer the last two research questions, researchers will use the survey strategy to see *what* is the supplier's compliance with Kinnarps requirements on different environmental attributes and *how* to group suppliers based on their environmental attitude.

3.2 Case Study

A meticulous description of a case study can have an greater impact than almost any other form of research report (Gillham, 2000). Same author underlines that a case study is a method not to be wasted on issues that are unimportant. A case study approach will enable authors to have an in depth understanding about Kinnarps in order to perform the research on green supplier selection and evaluation. A case study approach will be used in this research since there is no clear answer on how to control the environmental compliance of the upstream supply chain.

Six different types of case studies have been identified by Yin (2003.b), based on 2×3 matrix. A case study can be based on a *single* case *(focuses on single case study)* or on *multiple* cases studies *(including two or more cases within the same study)*. Also, the case study can be *exploratory, descriptive or explanatory*. In the table 3.2 is presented the techniques used in this research: exploratory and descriptive.

An *exploratory* case study is expected to define the questions of a case study or to determine the feasibility of the preferred research procedures. Exploratory case study is used to gather as much information as possible about the topic. A *descriptive* case study presents a complete picture of a phenomenon within its context of the researched topic. Describing the problem is more important for a descriptive case study rather than finding the its cause. An *explanatory* case study shows the data position on cause-effect relationship – elucidating how events happen.

Table 3.1 Presentation of the 2×3 matrix typology of the thesis research

Typology of case studies	***Single case study***	***Multiple case study***
Exploratory	**X**	-
Descriptive	**X**	-
Explanatory	-	-

In this research the authors will describe a *single* case study focused on Kinnarps green procurement aspects. A *descriptive* approach will be conducted in order to present the actual actions that Kinnarps is taking regarding to green procurement issues. An overall picture of Kinnarps green procurement will be presented and how suppliers comply with Kinnarps green requirements will be analyzed. This study will be also *exploratory***.** The authors will gather as much information as possible from the company and their suppliers regarding environmental attitude in order to understand what the actual situation is and what can be improved.

3.3 Research Approach

In theory exist two main approaches to research a topic: *quantitative* and *qualitative*. *Quantitative* research is based on empirical investigations and is structured and formalized. An example of quantitative research is the survey. On the other hand a *qualitative* research cannot be quantifiable, is based on achieving profound understanding of the problem and the main data is gathered through interviews.

Our thesis research will be conducted using both quantitative and qualitative approach in order to answer the research questions. Qualitative methods focus on the facts that will enable to understand the meaning of what is going on. Their great strength is that they can illuminate issues and turn up possible explanations. The qualitative research will help us to explore the complexity that is beyond the scope (Gillham, B., 2000). The authors seek to gain more knowledge about the environmental aspects of the company and its environmental criterion used in evaluating a supplier. On the other hand a quantitative method will be used to go into upstream supply chain to see the supplier's attitude regarding environmental issues and to compare it with Kinnarps expectations on the same topic.

3.4 Data Acquisition Method

Data can be collected via two methods: *Primary* and *Secondary* data. This paper will be analyzed using both primary and secondary data.

3.4.1 Primary data

Primary data are collected by the authors by carrying fieldwork themselves. Primary data can be gathered via interviews and surveys.

3.4.1.1 Interviews

Interviews will be one of our methods in collecting primary data. Interviews with the company will be hold in order to find the environmental policy that applies to the company in general and procurement process in particular. Interviews are known as the main data

collection tools in a qualitative research. Robson (2007) describes three formats of an interview: face-to-face, group and telephone interview. In our research we used group interview in order to have a different opinions and at the same time complimentary answers to the same question.

According to Bailey (2007), there are three main types of interviews used by researchers: unstructured; semi-structured and structured (table 3.2):

1. Unstructured or informal interview are similar to conversation, involve little standardization. During unstructured interview, the interviewee is giving free choice to talk on any aspects.
2. Semi-structured interview incorporates some predetermined questions while still allowing for considerable flexibility. The interviewer might engage in a dialog with the interviewee, rather than simple asked questions. We performed one semi-structured interview with the company in the begging of our research. The main idea was to find out more about Kinnarps environmental policies and to narrow down the topic of research by giving the freedom of the interviewee to express his feelings and preferences. A group format interview was selected to save time and to have complementary answers on the same questions. The main questions cover the environmental changes over years at Kinnarps in all departments: purchasing, R&D, production, transportation, customer service and reverse logistics.
3. Structured interview have predetermined questions and an interview guide that is closely followed. During the structured interview, the interviewer determines the questions, controls their order and place, and tries to keep the respondent on track. Structured interviews have been used by the authors to perform the interviews with the company purchasing and R&D management. An interview questionnaire was developed to answer the research questions (see appendix 2).

Table 3.2 Types of interviews used to perform the research with different Kinnarps departments and Kinnarp's suppliers

Types of interviews	***Kinnarps First interview (15.02.2010)***	***Kinnarps Second Interview (26.04.2010)***
1. Unstructured	-	-
2. Semi-structured	Logistics, Distribution and R&D managers.	-
3. Structured	-	Purchasing and R&D manager.

3.4.1.2 Surveys

Robson (2007) state that the questionnaire is the most used data collection method in social research, often in a conjunction with a sample survey. Surveys are popular as they look quite straightforward. They typically generate quantitative data and can be easily transformed into numbers.

Survey construction

The questionnaire was designed to answer last two research question: *what are Kinnarps' expectations regarding suppliers' green compliance and what is the actual suppliers' environmental attitude?* and *how suppliers can be grouped based on their environmental attitude*?

In order to answer those questions a survey was elaborated based on the conceptual framework "Environmental Pyramid" presented in the previous chapter.

Two different surveys were elaborated for both Kinnarps and Kinnarps suppliers. Two main types of question chapters were elaborated to conduct the survey. First group of questions (i.e. "chapter A" questions) was formed out of 7 general questions that describe the general aspects of the Kinnarps main suppliers, consequentially the suppliers will be those to answer the questions from the chapter A (see a sample in appendix 3).

The second chapter of the questionnaire "chapter B" – was elaborated based on the conceptual "Environmental Pyramid" framework of this research. The questions from the chapter B presents the attitude towards particular attributes in achieving green products. Chapter B is formed out of 21 questions grouped in four main blocks describing: environmentally oriented management and company, green product design, green competences and EMS and regulatory compliance. Each block has different questions that characterize the block name. The questions in chapter B were designed to be answered into a five point scale: not important, somewhat important, important, very important and most important. The chapter B questions will be answered both by the Kinnarps and Kinnarps supplier's top managers. The questions for Kinnarps will have the same environmental attributes as the questions for its suppliers. The chapter B questionnaire was designed to answer the importance of the specific attributes that a supplier must meet. Consequentially Kinnarps managers were asked to give their own opinion on how they expect a supplier attitude towards a specific environmental attributes to be. On the other side, Kinnarps main suppliers were asked to fill in the questionnaire on how important they find specific environmental attributes from their own perspective.

The sample of the "chapter B" questionnaire is presented in appendix.5 for Kinnarps and appendix 4 for Kinnarps suppliers. Table 3.3 presents which type of question is answered by which part.

Table 3.3 Questions distribution for the respondent

Top Managers from: / Types of Questions	Kinnarps	Kinnarps main suppliers
Questions from the Chapter A	-	X
Questions from the Chapter B	X	X

Survey data collection

After the questionnaire was constructed the data collection starts on the second Kinnarps interview. The sample was presented and described to the main managers responsible of the procurement part and data were collected from Kinnarps. Three different top managers from Kinnarps answered the questionnaire: purchasing manager, R&D manager and logistics manager. All three have a partial or total implication with supplier collaboration.

Questions from chapter B of the questionnaire regarding the importance of the specific attributes that a supplier must meet were answered by them.

At the same meeting the company's purchasing manager agreed to send the survey by email to the main Kinnarps suppliers. The main suppliers are part of the group A from Kinnarps ABC supplier classification. On the 27th of April 2010 the questionnaire was sent to all 54 suppliers of the "A" category. The last day to answer the questionnaire was set the 5th of May 2010. Later on the deadline was prolonged till 13th of May. In total 30 suppliers replied to the survey questionnaire.

3.4.2 Secondary data

Secondary data is the data already collected by other authors for other purpose. Secondary data are difficult to manipulate, a reason for this is coming from its quality and adaptability to new topic. Advantages to use secondary data are speed and costs (Gorard, 2003). Since the data already exists, less travel and minimal costs are necessary.

The secondary data used for this research comes from Kinnarps statistics reports on environmental issues, presentations provided, webpage as well as book and research articles related to environmental aspects.

Secondary data will be used as an important tool to describe the company environmental present situation and development over years. Furthermore, literature review will be used to look in the previous analyzed environmental frameworks of the different authors.

3.5 Data Analysis

Data starts to be analyzed after the ending of the gathering faze. By analyzing the data is understood the process of summarizing and rearranging the data in a way that will provide information (Zikmund, 2000). Silverman (2000) suggest transcribing as much as possible of what is said.

3.5.1 Interviews analysis

During the first interview both authors took notes of the overall picture of Kinnarps environmental supply chain management. During the second interview, the discussion was recorded by the authors. Recorded data is important because it is directly connected to the quality of the data analysis.

Miles and Huberman (1984) reflect the issue of how to move qualitative data from words to data analysis. They suggest three concurrent flows of activity to achieve this: data reduction, data display and conclusion drawing /verification.

Data reduction refers to the process of selecting, focusing, simplifying, abstracting and transforming "raw" data. It helped authors to decide upon which component to focus on.

Data display is an organized assembly of information that permits conclusion drawing and further action to be taken. Authors assembled the recorded information together with secondary data and developed an analysis to develop findings. It involves displaying data into matrices, graphs, networks and charts which draw the direction of the research.

Conclusion drawing refers to explaining what things mean using patterns, explanations causal flow and possible configurations. Authors have used charts, tables, dendrogram to elaborate conclusions. Verification refers to testing the conclusions for their plausibility,

sturdiness and validity. During the analysis process many operations were repeated to verify their validity (e.g. cluster analysis).

3.5.2 Survey analysis methods

In order to answer the last two research questions two different approaches of survey data analysis were used. All the answers of the questionnaire were transferred into Excel sheets. Microsoft Excel programme will be used to answer the question of *what are Kinnarps' expectations regarding suppliers' green compliance and how suppliers can be grouped based on the environmental attitude?* In order to answer the last research question *how suppliers can be grouped based on the environmental attitude?* a Statistical Package for the Social Sciences (SPSS) software program was used to cluster the suppliers based on their environmental attitude. To facilitate the data analysis in SPSS software program all the results from answers were transferred to Microsoft Excel programme using a codified system (see appendix 6.a and 6.b) in order to facilitate the data introduction in SPSS.

Custer analysis technique was used in this research and it refers to a multivariate data analysis. The attempt of this technique is to maximize the homogeneity of objects within the cluster by also maximising the heterogeneity between the clusters. The cluster analysis was performed by applying *hierarchical clustering algorithm* – in which the similarity to join clusters is calculated as the sum of squares between two clusters summed over all variables (Hair, Black, Babin & Anderson, 2010). The entire process of cluster analysis that was performed on the data received from survey is presented in the fifth chapter of this thesis.

3.6 Trustworthiness and Credibility

Robson (2007) articulates that any kind of data collection method that authors use, must to be defended against the reader. The paper must be credible or believable through the general explanation that researchers provide, including full details of what they did and why they did. Two specific concerns exist and are associated with the data collection and analysis. Are they reliable? Are they valid?

3.6.1 Reliability

The purpose of the reliability is to assure that if the research will take place several times under the same conditions the results will be the same or very close to the same outcome (Robson, 2007). The function of reliability is to reduce the errors in the research (Yin, 2003a). For the reliability to be calculated it is important for the author to document his or her procedure and to demonstrate that categories have been used consistently (Silverman, 2000).

In this research the authors conducted by themselves the interviews in order to reduce the misinterpretation of the questions and to make sure that the interviewers clearly understand what they are asking for. Authors used a standardized interview to make sure that errors in the data will not appear. Moreover, the author's mood during the interview was balanced and neutral. In this way the researchers tried to increase the reliability of the research.

Authors collected "rich" data from the interviews that enable to have a clear picture of what is going on. Requiring for systematic feedback about the data received helped authors to rule out the possibility of misinterpreting the meaning of what interviewee says.

Moreover, triangulation method was used. Triangulation refers to collecting data from different range of sources and individuals, using a variety of methods. If every kind of

evidence agrees then a confirmatory triangulation exists (Gillham, 2000). This strategy helped authors to reduce the biases and to allow a better assessment of the explanations and data that were gathered.

Reliability of the survey was ensured by sending the survey in Swedish language for suppliers based in Sweden and in English for supplier's abroad Sweden, English being an international recognized language. The reliability of the surveys was also guaranteed by having the respondents the top managers or at least the specialists from sales department from Kinnarps suppliers. Kinnarps top managers were meet to answer the questionnaire. The Kinnarps suppliers were asked to state on the questionnaire the name and the position they hold in the company.

The survey was designed to see the attitude towards a specific set of attributes related to environment. Thereof the risk of participant bias exists – that the respondents will answer to the questions based on what they "wanted" to answer rather on what the reality is. To avoid those biases the researchers tailored the questions, each supplier had the same structure and design of the questionnaire as Saunders, Lewis, & Thornhill (2007) suggests. However, answers regarding the environmental attitude are difficult to measure for validity.

3.6.2 Validity

Validity of the thesis reflects if the results are true and are what they appear to be (Saunders et al., 2007). Representing the capability of the authors to use the methods and to analyze what was intended to be. Using somehow flexible design in qualitative method a normal question will arise: are you telling the "truth"?

To ensure the validity of the interviews the authors made sure that they are interviewing the right persons and that the data collected from both primary and secondary data are accurate and used as groundwork for the research. Another factor used to increase the validity was to adapt the interview's standardized questionnaire with previous research papers questionnaires and frameworks related to environmental aspects of procurement.

For the survey research the validity embodies the procedures used to collect and analyze the evidence (Balnaves and Caputi 2001). Same authors present three different kinds of validity: *construct validity, internal validity and external validity*.

Construct validity refers to the extent to which the construct of the survey is successfully representing the phenomenon that is being studied. The construct of the survey studying environmental attitude of the main suppliers was constructed according to the outcome of the "Environmental Pyramid" summarized from the theoretical framework.

Internal validity refers to the extent to which this research design allows authors to draw the conclusions about the relationships between variables. In the present case, all the questions under analysis of environmental attitude have a level of importance from not important to most important and are ranked with"1" for not important, till"5" for most important. In this way it can be easily seen the differences between suppliers' answers and can be drawn the conclusion.

External validity refers to the extent to which the sample is genuinely representative for the population. Hair et al., (2010), suggests that if a sample of 50 or less observations exists then the researchers will not generalize the outcome to the whole population under analysis. In this case a census is required. Authors focused on analyzing environmental attitude of all 54 Kinnarps main suppliers, however only 30 of them answered. Due to this

fact cluster analysis will be valid only for 30 main suppliers but not all 54. Therefore the study population in quantitative research is 30 main Kinnarps suppliers.

3.7 Methodological framework

Methodological framework was designed to help the readers to understand the approach used to answer each research question.

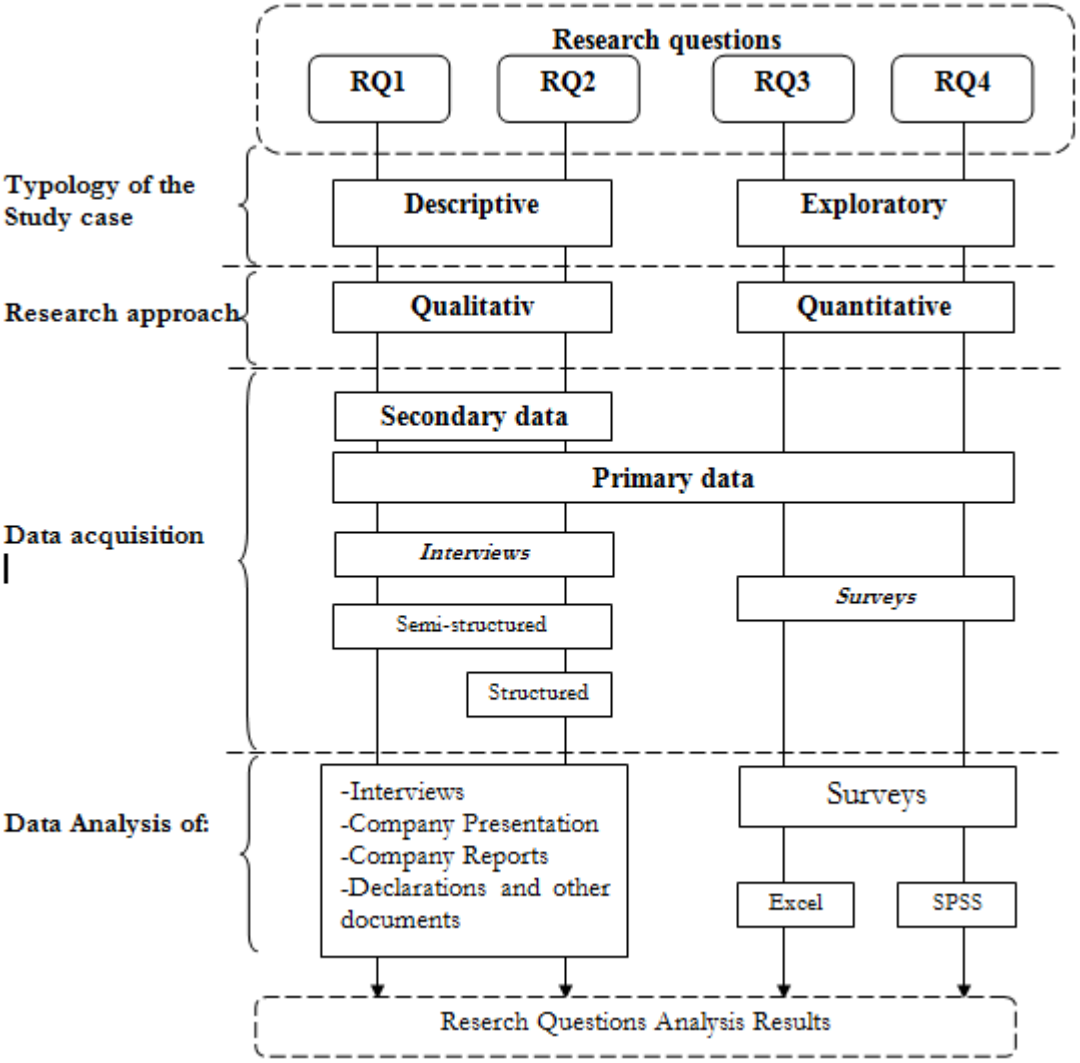

Figure 3.1 Methodological Framework of the Research.

4 Empirical findings

This chapter will present information about Kinnarps gathered from interviews, secondary data and questionnaires. It will contain company presentation, supply chain description, supplier evaluation policies and other data which are related to the research questions.

4.1 Company Description

Kinnarps AB was founded in 1942 by Jarl and Evy Andersson. Its main business is to supply interior solutions for offices and public spaces. Kinnarps is the largest office solution provider in Scandinavia and second largest in Europe. With 200 show rooms Kinnarps has sales representatives in 40 countries and has a strong collaboration with different suppliers that provides lightening, textile and acoustics. Kinnarps holds four strong brands – Kinnarps, Materia, Skandiform and Nordic Care– with different varieties of expressions. Kinnarps has a strong financial capability with an approximate total sale of 400 million euro per year. In the beginning of 2010 Kinnarps bought a well known German company Samas.

Kinnarps has three plants located in Kinnarp, Jönköping and Skillingaryd. Kinnarp plant produces descks and assembles the chairs. Jönköping plant deliver metal components for chairs and Skillingaryd plant produces soft seating. With an annual production of approximately 350 000 cabinets, 330 000 table tops and 250 000 desk chairs, Kinnarps delivers two workstations per minute. The final customer gets services of transportation, installation and after service from the company.

Kinnarps is certified and has worked in line with ISO 9001 and 14001 since 1997. Kinnarps is also EMAS-registered and publishes an annual environmental report on the environmental impact of its three factories.

The business philosophy of the Kinnarps is called 'better at work", committed to creating efficient and inspiring environments where people feel inspired to work. In the form of a snowflake the philosophy "better at work" show eight ways to become better. Environment is one way that Kinnarps believes can create a better work together with ergonomics, design, innovation, solutions, economy, competence and quality (Figure 4.1).

Figure 4.1 Snowflake "Kinnarps business philosophy" Source: Kinnarps international webpage.

4.2 Kinnarps environmental Supply Chain

The increased requirements from the customer side on greening the supply chain makes Kinnarps to be always ready to fulfill those customer needs. Environmental awareness started long time ago in Kinnarps. Sustainability view, certifications and innovations are important issues that Kinnarps is implementing over all supply chain processes as:

purchasing, production, transportation and reverse logistics. Environmental policy that Kinnarps has developed is the foundation that drives changes over improving the greening of the supply chain.

4.2.1 Kinnarps Sustainability view and evolution over years

According to company presentation made in the first interview, sustainability at Kinnarps is described in three main areas: *ecological, social and economical. Ecological sustainability* refers to preservation over the long term the productivity of the earth, its waters and its eco-system as well as to reduce the impact on nature and human health. *Social sustainability* describes the building of a durable, stable and dynamic society that meets basic human needs, and e*conomic sustainability* reflects the utilization of the human and material resources in a harmoniously way over the long term.

During the years Kinnarps made improvements in its processes regarding environmental issues. The company life time chart below presents some environmental innovations and awards received over years (figure 4.2).

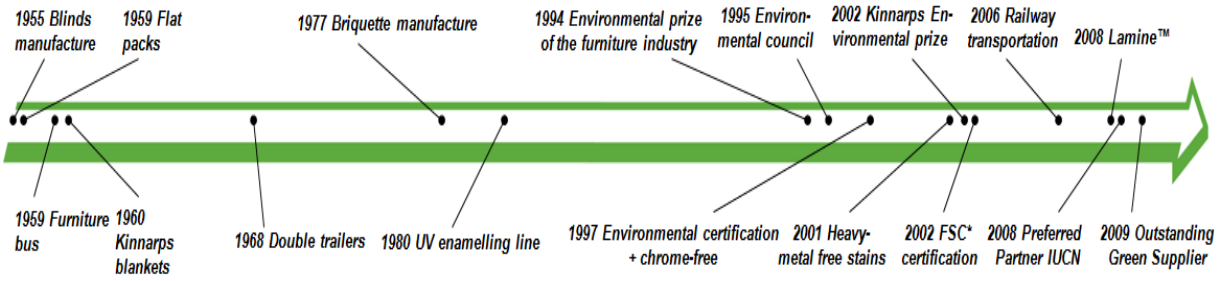

Figure 4.2 Kinnarps evolution over years of the implementation of the environmental processes and rewards ("KIN_MiljoHallb_EN", 2010).

For example, from 1960 Kinnarps started to use wrapping blankets to cover their products during delivery. The blankets are re-used over and over again. In 1977 the company started to produce wood briquette from material waste. The briquettes are used to heat the Kinnarp factory and surrounding village from reused waste material in an eco-friendly way. In 1994 Kinnarps received the" Environmental prize" of the furniture industry. In 1997 the company achieved the Environmental certification for tanning the leather with vegetable products and thus making it chrome free. In 2002 two important events with regard to environment happened at Kinnarps. First event was the environmental prize that Kinnarps received. Second event was the certification received from Forest Stewardship Council for assuring sustainable forestry. In 2006 with the growth of production Kinnarps transferred a part of its transportation on rail that goes to north of Sweden and central part of Europe. In 2008 Kinnarps was chosen to supply with furniture the most environmental building from Europe built by the International Union for Conservation of Nature (IUNC). In 2009 Kinnarps was awarded with the "Outstanding Green Supplier" award of the Swedish Environmental Management Council (MSR).

Kinnarps presents itself in the first interview as a company that holds the control over the entire supply chain - from sourcing of raw material and production of the components parts for final assembly till providing transportation, installation and after service of the product to the final customer (see figure 4.3).

Figure 4.3 The control over the supply chain, from raw materials to final customer and recycling (KIN_MiljoHallb_EN", 2010).

According to company presentation in the first interview, Kinnarps had implemented different environmental actions in different areas of supply chain: procurement (raw materials), production, transportation and customer values. An environmental policy and a sustainable view have been developed.

4.2.2 Procurement

According to information gathered during second interview with Kinnarps procurement and R&D manager and secondary data provided, Kinnarps pays an important attention to its suppliers, mainly to the one that is critical to the company, for example wood, steel and fabrics suppliers. Kinnarps totally owns two other factories of raw materials, plant in Jönköping that produce steel components and plant in Skillingaryd sewing fabrics. Both factories ensure a higher control over the supply chain in the upstream part. Kinnarps also has clear quality requirements on materials as well as environmental demands on all types of raw materials such as wood, plastics, chemicals, fabrics, textiles and metals. According to information provided by Kinnarps, for raw material as wood, Kinnarps has a close cooperation since 1998 with the Forest Stewardship Council. The collaboration led Kinnarps to implement Chain of Custody certification as a step towards assuring sustainable forestry. All the steel that goes into Kinnarps production contains 20% recycled material. Other metals used like cast aluminium contains 95% recycled material and extruded aluminium 65% recycled material. Kinnarps also actively seeks out less environmentally harmful plastics containing more recycled material. Kinnarps makes rigorous demands on fabrics and textiles to ensure that they are manufactured in a responsible and environmentally optimal way. As a regard to chemicals, Kinnarps does not permit any products that are prohibited by the EU chemicals legislation REACH (**R**egistration, **E**valuation, **A**uthorisation and Restriction of **Ch**emical substances) or may produce noxious emissions.

According to Purchasing manager, Kinnarps obliges its suppliers to maintain the same high standards that Kinnarps apply to it selves. Kinnarps provides training for its suppliers and employees regarding quality and environmental issues. Those trainings are made by

Kinnarps quality department and sometimes by other organizations e.g. FSC. "All suppliers are obliged to follow Kinnarps code of conduct", says Purchasing manager. The code of conduct is based on the ten principles of the UN Global Compact for responsible business. These ten principles stipulate conditions to be followed by companies in the areas of labour standards, human rights, environmental aspects and anti-corruption. Suppliers must provide information regarding the issues above and allow access to any data upon request. Compliance with the requirements from the code of conduct is verified and maintained through audits (i.e. third party) or through other appropriate verification. The Kinnarps "Code of Conduct" stipulates that, the supplier is requested to accept responsibility to ensure that its employees and subcontractors are informed and comply with the Kinnarps Code of Conduct. Identified or reported violation of the Code is properly investigated. "*Violations can lead up to and including termination of contract"*, as stipulated in the Code.

In addition, Kinnarps encourage environmental efforts by awarding the "Kinnarps Environment Prize" to deserving suppliers. In 2001, 2004, 2006 and 2008 the prize went to a Swedish Sawmill, Öveds sågverk, Becker and Mack Faner.

4.2.3 Production

Kinnarps production environmental view is presented as a smarter product development, according to company presentation documents, which means lower material consumption, more efficient utilisation and more recycling of raw materials.

Kinnarps presents that all its products can be recycled 100% by material and/or energy recovery. Figure 4.4 presents the cycle principle (company presentation information) with income of different resources and outcome of the emissions that come from production process.

Chemicals, water, energy and different raw material as wood, steel and fabrics are used into production process. On the other side the outcome is the main product (furniture), and different emissions of noise, water and other waste. None of the material is classed as waste before ascertaining that it cannot be used in production. If yes then all of them are recycled in order to achieve the environmental goals (company presentation slides).

Flammable waste such as sawdust, paper, used packaging and woodchips are compressed into fuel briquettes, then burn in Kinnarps custom furnace to heat the factories, adjacent industries, the town's school, sports hall, bank, retirement homes and many private residences in the village of Kinnarp. Over 70% of Kinnarps' industrial waste is reused by briquetting wood since 1977. Every year Kinnarps produce wood briquette that is an equivalent of using over 2,500 m3 of oil or 6500 tons of CO_2. The factory in Skillingaryd is also self-sufficient in heating. Furthermore, all metal waste is resold to the suppliers for material recycling. Fabric waste from the Skillingaryd factory is used as padding material for company sound-absorbent screens. Altogether only 1.5% of all solid industrial waste is sent for disposal (same company presentation slides).

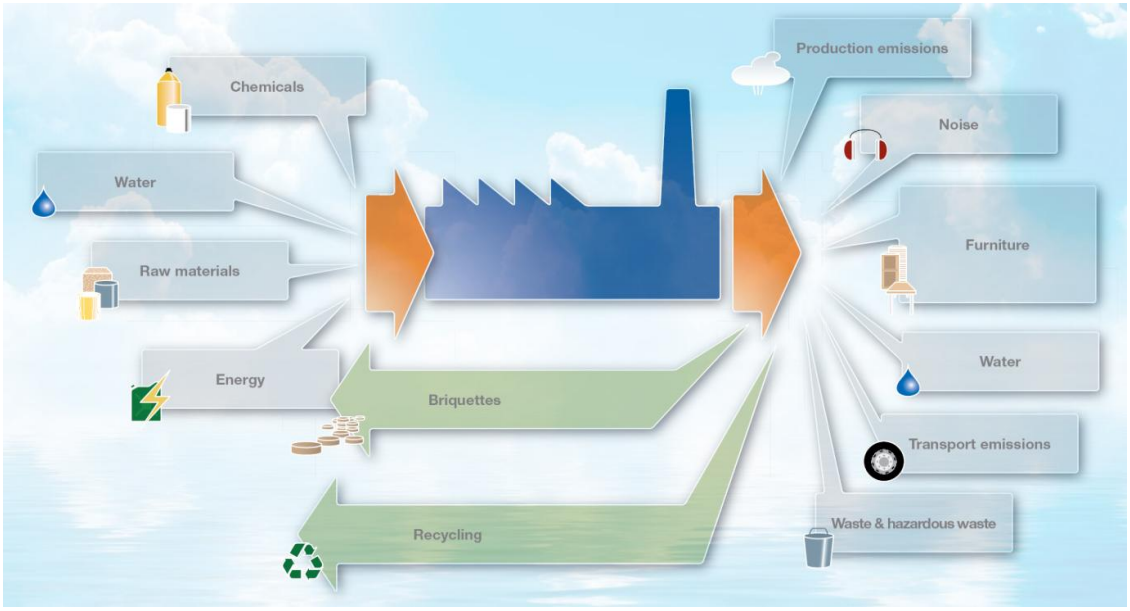

Figure 4.4 The cycle principle ("KIN_MiljoHallb_EN", 2010).

The corporate culture enable that both employees and management constantly seek to find new solutions to problems as well as ways of saving resources, as company presentation says. Such innovations are presented in the following. For instance the [f] Series, – lightweight table tops whose inside consists of a honeycomb structure of recycled cardboard. The result: a more durable surface which is also lighter and uses less material. Also, Lamine™ – replaces laminate and dramatically reduces quantities of non-renewable raw materials. Further, Rezon – 50% of its isolating material is from recycled textile waste from Kinnarps own production. Kinnarps HR (High Resilience) foam is completely free of brominated or halogenated flame retardants and uses water-based release agents. Since the beginning of 2009, Kinnarps has been producing its own upholstery material that covers the furniture without using TDI or solvent-based release agents, according to company information from the presentation. Home produced upholstery material as a result satisfies the strict emission requirements of the "Blue Angel" mark. The "Blue Angel" is the first and oldest environment-related label for products and services in the world established in 1978.

4.2.4 Transportation and customer value

Based on the data gathered in the first interview, Kinnarps is taking care of the transportation of the final product to the customer. Almost all modes of transportation are used. In Scandinavia where the biggest market of the company is located, 70% of the transportation is made by road. Kinnarps owns 60 trucks and 175 containers. To ensure a high load capacity Kinnarps collaborates with truck producer Scania to develop customized trucks and containers, says transportation manager Assar Jarlsson. All goods are shipped in environmentally adapted trucks that run on eco-diesel and tyres without aromatic oils. All delivery personnel are trained in eco-driving that starts in the company 20 years ago (presentations data). Kinnarps loading capacities of the trucks is to an average of 91% and always try to carry goods from their subcontractors on the return journey – says Mr. Jarlsson. Moreover, the delivery personnel leave nothing behind after installation. All furniture is packaged and protected with Kinnarps blankets and cardboard that is simply returned to base and reused. The customers greatly appreciate not having to dispose of any packaging. Rail transportation is used to serve the customers in north of Sweden till Luleå,

and central part of Europe, till Germany, Ghent. Some trial rail transportation was performed to Norway. Sea transportation is used to serve the customers in UK, Middle East (Saudi Arabia), Latin America and Asia. From Gothenburg to London six containers in a fairy are used to transport the goods.

In 2001 Kinnarps introduced customized software that makes the transportation more efficient. During the first interview with Kinnarps, the IT system was presented to the authors. TP software is design to calculate the best route for delivery of the goods by road. The system presents "live information" about the trucks place, capacity and orders that have been fulfilled and that are going to be fulfilled. When a new order come the system facilitates the choice of the best truck to full fill that order. The system implementation not only improved the delivery process of the goods by making it more efficient but also had decreased the amount of km to reach the customers. In this way less fuel is consumed and consequently less emissions of hazardous gases.

Kinnarps customers require more and more products that are environmentally friendly, according to interviewees. Kinnarps is producing high quality products that help users to improve their work. The products have a long life and designed to help users to reduce their environmental impact. Some products have ten years or more time life. However, the market change in tastes and other factors (e.g. change of location) requires the development of new products. That is why Kinnarps is adapting to new market changes constantly and is producing new products every months and a full office solution in less than 2 years. With a careful analysis and space planning the products can reduce the local area needed for the office, e.g. hot desking, allows a workplace to be used by several people. Recycling stations, multiple sockets with switches and LED lamps can dramatically reduce power costs as well as the cost of unsorted waste. Ergonomically designed workplaces help employees feel better, increase their performance and avoid expensive absences due to ill health (company information data).

4.2.5 Reverse Logistics

According to second interview and company documents, Kinnarps reverse logistics can be described in two parts: reverse of the packaging and reverse of the products. Reverse of the packaging has been implemented since 1960 when all the products were covered by wrapping blankets during delivery to the customer. The blankets do not leave the container area, as such the transportation to the point of origin is facilitated and blankets are reused over and over again. On the other aspect, there were attempts from the Kinnarps side to take back the products from the customers after the customers stop to use them, but due to the customer unwillingness to return the product, this matter is remaining a challenge for the future, according to Branko Vukota, R&D manager.

4.2.6 Environmental policy

Kinnarps is an environmentally aware corporate culture. The company has developed an environmental policy that presents the commitment of the company towards continuous improvement of the environment. The company environmental goal is a long term sustainable development, by using fewer resources and having a small environmental impact. Kinnarps environmental policy focus on ten main aspects that influence company business: *responsible forestry, efficient transportation, communication, competence, a good working environment, prevention, economic use, care, life cycle approach and compliance with legislation.*

Responsible forestry – refers to obtaining all the wood raw materials from responsibly managed and if possible environmentally certified forests. *Efficient transport* – refers to

transportation of the goods in the most efficient way using environmentally friendly vehicles and with reusable packaging. *Communication* – refers to an open dialogue on environmental issues internally, inside the company and externally, with suppliers, people and organizations. *Competence* – refers to development of the environmental skills of company employee by providing information and training. *A good working environment* – refers to the development of a working environment which encourages hard work, influence, personal development and safety in all processes. *Prevention* – refers to prevention of the undesirable environmental impacts by tackling potential problems at source. *Economic use* – refers to ensuring that materials and energy are used sparingly and recycling residues and waste. *Care* – refers to the planning activity that prevent environmental accidents and that minimize the use of substances and chemicals which can be hazardous to environment and people. *A life cycle approach* – describes the use of a life cycle approach to adapt production processes and product development in order to reduce the environmental impact, today and in the future. *Compliance with legislation* – refers to ensure that company fulfills all significant environmental legislation.

4.3 Kinnarps suppliers evaluation

Kinnarps AB is a big company which correspondingly has a large number of suppliers. The process of selection and evaluation of suppliers is in general an intricate task that requires a lot of time, effort, people and money inputs. Thus when a company has a lot of suppliers this process becomes even more obscure to maintain and develop. Further down we will disseminate the qualitative data obtained from Kinnarps interviews that brings light upon the routines to accomplish the supplier evaluation.

4.3.1 Interview data

As mentioned above Kinnarps has a thick portfolio of suppliers and more exactly around 400. For an efficient control, suppliers are classified according to the ABC classification method and approximately 54 suppliers are part of *group A*, around 100 of *group B* and the rest are included in *C group*.

The relationship with the suppliers is long term oriented and the purchasing manager, Christine Salven, specifies that "if we start up a relationship with a supplier then we keep it for a long time". New suppliers are not so often contracted and very few new comers are let in, especially, during the recession time and also because of the long term vision. Last year, in 2009, only 5 new suppliers have been added while 10 old suppliers were eliminated since they went bankrupt due to the economic crises.

The process of selecting and evaluating the suppliers has been developed in a specific template. The main factors that are taken into consideration are the price, quality and logistics. Essentially if the price factor is fulfilled than the next stage comes to audit and evaluate the production capacity, technology and machinery availability, ISO 9000/14000 certificates, product quality, and financial stability of the supplier. The environmental criteria are mirrored in the environmental policy of Kinnarps which aims to achieve a long-term sustainability development through using smallest possible amount of resources with a smallest environmental impact. According to these policy suppliers must also obey the environmental legislation, must develop environmental dialogue, prevent environmental impacts, develop and refresh environmental skills, etc. The last stage of evaluation goes deeper into the suppliers' operational routines. Furthermore, the purchasing department develops a measurement tool, Balanced Scorecard, for suppliers. It includes criteria such as: cost, savings, service level, quality, claims from customers, staff training.

Environmental certification is a good achievement but it is not a strict criterion to evaluate suppliers. About 80 % of suppliers are certified with EMS. These suppliers are part of all ABC groups and there are no strict requirements regarding EMS for A, B groups. Rather, more strict environmental consideration is applied on production companies.

Kinnarps Code of Conduct is a comprehensive guide for supplier as well. All suppliers are obliged to follow this code of conduct – both internally and externally and to maintain the same high standards that Kinnarps apply to their selves. Thus it is expected that suppliers expose the same environmental demand on their own suppliers.

Kinnarps has two own suppliers of product components in Skillingaryd and Jönköping. R&D Manager, Branko Vukota, says that "it is a little bit different with these suppliers but we impose the same demands on al suppliers. They must maintain their competitiveness on the market if they want to keep their jobs". One of their main advantages is proximity to Kinnarps factory. Proximity factor is an important factor when evaluating suppliers and 83-85 % of total suppliers are located in Sweden. Other 15 % are from Germany, Italy, Lithuania, Poland, Romania, Denmark, etc. Kinnarps strives to keep the suppliers closer to its production facilities but if any other efficient opportunities appear than they will go for it. In the same time, the company is willing to reduce as much as possible the total number of suppliers because it is costly and time consuming to maintain such a large number.

The fact that Kinnarps is building long term relationships with suppliers means that when they evaluate and select a supplier they must detect suppliers' willingness to collaborate and share information. Kinnarps must have access to the data it is interested in and also is willing to provide the necessary information and support back to suppliers. Every second or third year, the company designs new products in collaboration and assistance of specific suppliers and organizes environmental trainings which involve suppliers.

Since Kinnarps is a company that provides office solutions it is obviously that besides these suppliers there other suppliers of complimentary products (e.g. lighting companies). However, these suppliers are not part of the Kinnarps system, thus the relationship is limited to a business agreement of partnership and the official evaluation system does not apply to them. Nevertheless, they are also required to fulfill specific criteria in order to be contracted (e.g. financial stability, mutual benefits, certificates).

4.3.2 Survey data

Based on the conceptual framework "Environmental Pyramid" the authors have developed a questionnaire with environmental criteria. The data from the survey were gathered in 2 steps: step one – gathering the survey data from the Kinnarps top managers, and step 2 – gathering data from the supplier's top managers.

4.3.2.1 Kinnarps top managers answer

Presentation of the data gathered from the top management of the Kinnarps related to the question how important they consider being specific environmental attributes in achieving green procurement at Kinnarps. Data were collected from three top managers from Kinnarps: Purchasing manager, R&D manager and Logistics manager. All three managers are totally or partially connected with suppliers. Purchasing manager has a total connection with all suppliers that Kinnarps collaborates. The main duties are to maintain a good relationship with suppliers. Selection and evaluation are the main duties of the departments that she represents. Research & Development manager has a partial connection with suppliers. The connections take place when a new product design takes place, which

happens quite often. Logistics manager also have interactions with suppliers. A part of all transportation from supplier to Kinnarps factory is performed by Kinnarps. Kinnarps prefer to transport the materials from suppliers using their own means of transportation. Consequentially the logistics manager has also its own perspective on how suppliers must meet green criteria.

All three managers expressed their individual opinion on what attributes related to green procurement a supplier must meet in order to satisfy Kinnarps environmental criteria. Each question has 5 possible answers – from not important to most important (see appendix 5). Each answer was given a value in order to be quantified. For the answer "not important" the value "1" will be given, for answer "somewhat important" – "2", for "important" – "3", for "very important" – "4" and for "most important" – "5".

As presented in appendix 5 the questionnaire for the Kinnarps managers contains 21 questions regarding environmental awareness grouped in 4 blocks.

Kinnarps top manager's expectations as estimated in the appendix 7 presents a total average of the answers being as 3.77 which can be described as a general green procurement view close to very important. All three managers have an individual general view close to each other scoring 4.04, 3.62 and 3.64 (close to/and very important).

First questionnaire block (table 4.1): *Environmentally oriented management and company* - Scored in average 3.46, between "important" and "very important". The highest importance is given to questions a. and b. (environmental support of supplier's senior management and environmental awareness of the supplier's top managers) – scoring "very important". On the other side the suppliers green image on the market is not seen as important as others and has a scoring between "somewhat important" and "important".

Table 4.1 Kinnarps managers expectations on suppliers environmentally oriented management and company block

Managers /Questions	1. Environmentally oriented management and company					Average
	a. The environmental support of supplier's senior management	b. The environmental awareness of their purchasing, production, logistics managers	c. Suppliers green image on the market	d. Supplier proximity to the buyer or possibility to locate closer	e. Green information availability, sharing and environmental training	
R&D Director	4	4	2	4	4	3.6
Purchasing Manager	4	4	3	3	3	3.4
Logistic Manager	4	4	3	2	4	3.4
Average	4	4	2.667	3	3.6667	3.467

Second questionnaire block (table 4.2): *Green product design* - Scored in average 4.05, or "very important". The highest importance is given to questions b., d., e., and f. (possibility to recycle, disassembly, disposability and durability) – scoring higher than "very important". On the other side, the suppliers' possibility to remanufacture is not seen as important as others and has scored just "important".

Table 4.2 Kinnarps manager's expectations on suppliers green product design block

Managers /Questions	2. Green product design						Average
	a. Possibility to re-use	b. Possibility to recycle	c. Possibility to re-manufacture	d. Possibility to disassembly	e. Product disposability	f. Product durability	
R&D Director	4	5	3	5	5	4	4.333
Purchasing Manager	4	4	3	4	4	5	4
Logistic Manager	4	4	3	4	4	4	3.833
Average	4	4.333	3	4.333	4.333	4.333	4.056

Third questionnaire block (table 4.3): *Green competences (to manufacture and deliver)* - Scored in average 4.05, or "very important". The highest importance is given to questions c., e., and f. (optimized loads, pollution control and resource consumption control) – scoring higher than "very important". On the other side, the suppliers' return loads capability and green choice of transportation is not seen as very important as others, scoring a bit below "very important".

Table 4.3 Kinnarps manager's expectations on suppliers green competencies (to manufacture and deliver)

Managers /Questions	3. Green competencies (to manufacture and deliver)						Average
	a. Green packaging	b. Green choice of transportation	c. Optimized loads	d. Return loads capability	e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	f. Resource consumption control (energy, water, material consumption)	
R&D Director	5	4	5	4	4	5	4.5
Purchasing Manager	3	3	4	4	5	4	3.833
Logistic Manager	4	4	4	3	4	4	3.833
Average	4	3.667	4.333	3.667	4.333	4.333	4.056

Fourth questionnaire block (table 4.4): *EMS and Regulatory compliance* - Scored in average 3.5, or between "important" and "very important". The highest importance is given to questions a., b., and d. (environmental certification, suppliers green procurement standards and regulatory/legal compliance regarding environment) – scoring almost "very important". On the other side the supplier's green process, planning and monitor is not seen as very important as others, scoring only "important".

Table 4.4 Kinnarps manager's expectations on suppliers EMS and Regulatory compliance

Managers /Questions	4. EMS and Regulatory compliance				Average
	a. Environmental certification (e.g. EMAS; ISO140001)	b. Supplier's green procurement standards	c. Green process planning, monitoring and control	d. Regulatory and legal compliance regarding environment	
R&D Director	4	4	3	4	3.75
Purchasing Manager	3	3	3	4	3.25
Logistic Manager	4	4	3	3	3.5
Average	3.667	3.667	3	3.667	3.5

4.3.2.2 Kinnarps supplier's top managers answers

Totally, 54 Kinnarps suppliers had received the survey on topic "green supplier". All of them are important suppliers, classified in group "A" form the ABC supplier classification. At the end of the dead line of the survey to be answered, 30 suppliers sent their answers. The response rate of the survey result is 55%. The respondents hold different positions in their companies, some surveys were answered by sales managers, by account managers and others company top managers.

The survey for suppliers is composed from two different chapter questions: A and B. Chapter A questions refer to general information about supplier and supplier relationship with Kinnarps. Chapter B questions present the supplier view of the importance of different green attributes in their own company. The answers from suppliers on chapter A is presented in appendix 8 and the answers from the chapter B of the survey is presented in appendix 9.

Some suppliers did not answer all the questions in the questionnaire. Two companies did not answer by one question from the chapter A. Moreover, in chapter B, four companies have missed to answer one question each. The missing answers are represented in the appendixes 8 and 9 with a white cell. All managers expressed their individual opinion on what attributes related to green procurement are important for their company. In chapter A the answers are presented as they are in the survey. The table 4.5 presents some answers of 7 suppliers, the appendix 8 presents the answers of all suppliers.

Table 4.5: Survey partial result from Kinnarps main Supliers (answers on Chapter A).

N/O	Company/Questions	A. General information about the company.						
		1. How many employees does you company have?	2. For how long do you collaborate with Kinnarps?	3. How would you evaluate your relationship with Kinnarps?	4. What is the distance between your company (factory) and Kinnarps headquarters ?	5. How much of you production is bought by Kinnarps?	6. Does Kinnarps AB own some shares in your company?	7. Do you have any Environmental Management Systems? Please indicate which.
1	[redacted]	50-99	< 10 years	strong	100-499 km	20-50 %	no	Certified
2		100-499	< 10 years	strong	100-499 km	2-10 %	no	Certified
3		50-99	< 10 years	very strong	100-499 km	>2 %	no	no
4		100-499	< 10 years	very strong	100-499 km	10-20 %	no	Certified
– –								
28		50-99	6-10 years	very strong	1000-4999 km	2-10 %	no	no
29		100-499	6-10 years	very strong	1000-4999 km	2-10 %	no	Certified
30		100-499	4-5 years	normal	100-499 km	2-10 %	no	Certified

As the appendix 8 shows, 30 main suppliers of Kinnarps sent their reply on the survey: 18 Swedish and 12 outside of Sweden (7 from Germany, and by one from United Kingdom, Poland, Italy, Switzerland and Czech Republic). The questions answered by suppliers in this part of the questionnaire represent general questions about the company. For the question of the number of the employee 11 suppliers have less than 50 employees, and 3 companies have more than one thousand employees. The second question was intended to present the length of the collaboration between suppliers and Kinnarps. 14 suppliers have a collaboration that is longer than 10 years. 13 suppliers collaborate with Kinnarps for 6-10 years and only and only 3 suppliers collaborate for less than 5 years (one of them less than 3 years). For the question on how they evaluate the collaboration with Kinnarps they say "strong" - 14 and "very strong" – 15, only one supplier answered "normal". The fourth question asked the distance of the supplier from Kinnarps. 5 Swedish suppliers are located very close to Kinnarps (less than 99 km), on the other side most of the international suppliers are located relatively far (more than 1000 km). The fifth question was asked to see the dependence of the supplier on Kinnarps, respectively the question on how much of your product is bought by Kinnarps was asked. Two Swedish companies didn't answered this question (see appendix 8), 8 suppliers sell less than 2% to Kinnarps, 9 suppliers sell between 2-10%, 6 suppliers sell between 10-20% and 4 suppliers sell more than 20% to Kinnarps (one of them more than 50%). All suppliers answered negatively to the question if Kinnarps owns any shares in their companies and finally on the last general question 20 suppliers have some kind of environmental certification and 10 don't.

In Chapter B of the supplier survey each question has 5 possible answers – from not important to most important (see appendix 4). Each answer was given a value in order to be quantified. For the answer "not important" the value "1" will be given, for answer "somewhat important" – "2", for "important" – "3", for "very important" – "4" and for "most important" – "5" same as in the presentation of answers from Kinnarps survey. The results from the suppliers' top managers regarding green supplier is presented together with the average on each question block and total average is presented. In order to reflect the average for each block of the survey and total average the authors calculated Cronbach's Alpha coefficient. Cronbach's Alpha is a coefficient of reliability and measure the internal consistency of how related a set of items are as a group. A coefficient of 0.7 is considered "acceptable" in social science research situation (UCLA, Academy Technology Service, 2010). SPSS software was used to calculate Cronbach's Alpha coefficient. For the total average of 21 questions regarding environment, Cronbach's Alpha equal 0.925 showing a very high consistency, consequently can be reliable to use for further research. The appendix 10 the Cronbach's Alpha coefficient for all 21 questions and for each block separately. All together suppliers green attitude is between "important" and "very important" scored 3.63 (see appendix 9).

First questionnaire block (table 4.6): *Environmentally oriented management and company (*Cronbach's Alpha coefficient equals 0.791*)* - Scored in average 3.59, between "important" and "very important". The highest importance is given to questions a., b. and c. (environmental support of supplier's senior management, environmental awareness of the supplier's top managers and green image on the market) – scoring close to "very important". In the same time, the suppliers see the proximity to the buyer only "important".

Table 4.6 Kinnarps suppliers top manager's attitude on environmentally oriented management and company block

N/O	Company/Questions	1. Environmentally oriented management and company					
		a. The environmental support of senior management	b. The environmental awareness of purchasing managers, production and logistics managers.	c. Your green image on the market	d. Your proximity to the buyer or possibility to locate closer	e. Green information availability, sharing and environmental training	Average
1	[redacted]	4	4	3	3	4	3.6
2		5	5	4	4	4	4.4
3		3	3	3	4	3	3.2
4		4	3	4	2	5	3.6
—	—	—	—	—	—	—	—
28		3	4	3	3	3	3.2
29		4	4	4	1	3	3.2
30		4	4	4	2	4	3.6
	Average	3.7	3.9	3.767	3	3.5	3.592

Second questionnaire block (table 4.7): *Green product design (*Cronbach's Alpha coefficient equals 0.860*)* - Scored in average 3.46, or between "important" and "very important". The highest importance is given to questions b. and f. (possibility to recycle and product durability) – scoring "very important", while, the supplier's attitude on possibility to remanufacture, disassemble and to re-use is not seen as important as others, scoring just "important" or a bit below "important".

Table 4.7 Kinnarps suppliers top manager's attitude on suppliers green product design block

N/O	Company/Questions	2. Green product design						
		a. Possibility to re-use	b. Possibility to recycle	c. Possibility to re-manufacture	d. Possibility to disassemble	e. Product disposal	f. Product durability	Average
1	[redacted]	3	3	2	2	2	3	2.5
2		4	4	4	4	4	4	4
3		4	4	3	3	4	4	3.667
4		2	3	2	4	3	4	3
—	—	—	—	—	—	—	—	—
28		4	4	3	3	3	4	3.5
29		1	3	1	3	3	5	2.667
30		2	3	2	2	3	4	2.667
	Average	3.2	3.867	2.9	3.167	3.517	4.133	3.464

Third questionnaire block (table 4.8): *Green competences (to manufacture and deliver),* Cronbach's Alpha coefficient equals 0.878 - Scored in average 3.76, or close to "very important". The highest importance is given to questions c., e., and f. (optimized loads, pollution control and resource consumption control) – scoring "very important" and higher. On the other

side the supplier's attitude on green packaging and return loads capability is not seen as very important as others, scoring closer to "important" than "very important".

Table 4.8 Kinnarps suppliers top manager's attitude on suppliers green competencies (to manufacture and deliver)

N/O	Company/Questions	3. Green competencies (to manufacture and deliver)						
		a. Green packaging	b. Green choice of transportation	c. Optimized loads	d. Return loads capability	e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	f. Resource consumption control (energy, water, material consumption)	Average
1	[redacted]	3	3	4	3	3	4	3.333
2		4	4	4	3	4	4	3.833
3		4	4	4	4	5	5	4.333
4		3	3	4	2	4	4	3.333
28		3	3	4	4	4	4	3.667
29		3	3	4	1	4	4	3.167
30		3	3	4	2	4	4	3.333
	Average	3.367	3.5	3.967	3.409	4.167	4.167	3.763

Fourth questionnaire block (table 4.3.2.2.5): *EMS and Regulatory compliance (*Cronbach's Alpha coefficient equals 0.726*)* - Scored in average 3.7, or relatively close to "very important". The highest importance is given to question a. and d. (environmental certification, and regulatory/legal compliance regarding environment) – scoring almost "very important" and more than that. On the other side the supplier's attitude on green procurement standards and green process, planning and monitoring is not seen as very important as others, scoring a bit more than "important".

Table 4.9 Kinnarps suppliers top manager's attitude on suppliers EMS and Regulatory compliance

N/O	Company/Questions	4. EMS and Regulatory compliance				
		a. Environmental certification (e.g. EMAS; ISO14000l)	b. Presence of green procurement standards	c. Green process planning, monitoring and control	d. Regulatory and legal compliance regarding environment	Average
1	[redacted]	4	3	3	3	3.25
2		4	4	4	5	4.25
3		3	2	2	5	3
4		4	3	4	4	3.75
28		4	3	2	4	3.25
29		4	3	3	5	3.75
30		4	4	4	4	4
	Average	3.828	3.267	3.467	4.267	3.707

5 Analysis

In this chapter we will analyze the empirical data from chapter 4 using the theoretical framework from Chapter 2 and will try to answer the research questions stipulated in the first chapter. The first research question will be deployed in the first subchapter while the other three will be depicted in the second subchapter. The first two questions are qualitative while the other two are quantitative.

5.1 Kinnarps supply chain analysis

Empirical data reveals the fact that taking care of environment is a natural part of Kinnarps history. When Kinnarps was founded, 68 years ago, there was not so much talking about the environment while the idea to economize resources was a natural component of company philosophy. Jarl and Eva Andersson, the founders, never knew that environmental issues they treated as ordinary will become so acute and lamentable. Thus it was a start with a "right foot" for Kinnarps to include the environmental awareness moreover because production companies, according to Fiksel (1996), are considered the perpetrators of harming the environment. It entails that production companies like Kinnarps have a bigger impact due to the full complex of manufacturing and logistics processes and thus a bigger responsibility is set on its shoulders when it comes to environmental awareness.

5.1.1 RQ1. What is the actual situation at Kinnarps in greening the supply chain?

Of course, greening the supply chain has been shaped during company's history correspondingly to the encountered eco- challenges, social concerns, regulations and other factors (Hutchison, 1998). Thus we cannot define a specific period or a sudden change when it started rather it was a continuous, developing process. This fact speaks about the environmental approach Kinnarps endorses: a mixture of proactive and value seeking approach. The company is actively involved in designing green products and recycling, as characteristic components of the pro-active approach, and in the same time it aims to reduce its environmental impact as a value seeking company (Kopicki et.al., 1993). The proactive approach can be regarded to a sort of reverse logistics thinking which currently is not enough for companies with high environmental awareness as Kinnarps is. Thus value seeking approach comes to compliment the pro – active environmental operations with more attention directed towards the life-cycle of products, disassembly possibility, environmental trainings, etc. At this point is very important to involve major actors of the supply chain in environmental management processes (Walton et al., 1998). Kinnarps acknowledges these requirements and organizes systematic environmental trainings of suppliers, involves both the customer and supplier in designing the products and shares information regarding new environmental challenges to be addressed.

The supply chain green organization can be related to the extended model of supply chain proposed by Beamon (1999) in which we can find included the proactive elements that stand for package re-use and product recycling and remanufacture (figure 2.2) but also it goes beyond it through the value seeking strategy. Kinnarps supply chain includes all the green components enumerated by Hervani et al. (2005): green purchasing, green manufacturing, green distribution and reverse logistics but also inserts a new component

that could be defined as Green Customer Value creation. This component implies the ergonomics, the durability of the delivered products and the post sale services which engender green customer values.

The environmental principles of the supply chain design listed by Tsoulfas & Papis (2006) are included in Kinnarps environmental policy and have been already transformed in sort of operational routines:

Product design. Every second, third year or at a specific need, Kinnarps gathers its engineers from Research and Development Department (R&D) together with stakeholders from other departments and necessary suppliers to design new products. New products mean always smarter, more durable, more useable, less harmless and environmentally disposable. The ergonomics should be improved and fewer resources should be involved. Designing new products requires an exhaustive approach which should combine the perfect green product design (i.e. re-usable, recyclable, able to re-manufacture, to dispose environmentally friendly) with technological capability and research achievements of both suppliers and Kinnarps, and also with the trends and customers tastes. It is not easy to find a compromise between these factors and thus there is always place for improvements.

Packaging - design the package for possibility to re-use and recycle. Kinnarps tries to escape the cardboard packaging since it is not easy to recover, to re-use it and is costly. Since 1960, the company uses blankets to cover and protect the furniture while delivering. It is taken back after the delivery and installation of products and is used again and again. Still, there are some long distance orders, e.g. Middle East, where usual inefficient packaging (e.g. chipboard) is unavoidable for the purpose of better protection during the transportation.

Collection and transportation. All products, in partial assembly (e.g. desks) or full assembly (e.g. chairs) are folded in blankets and transported to the customer. The trucks were specially designed already in 1968 to increase the volume capacity over 50 % and are constantly adjusted and improved by the internal technicians. A major role in making transportation efficient is due to the contribution of a specially designed information systems which allows organizing and systemizing the customer order according to the date of order placing, location of the customer, return loads possibility, etc. Thus the products are combined in trucks in a way to accomplish the most efficient delivery trip. Maximum usage of load capacity is possible in flat packaging methods, which is a feature of high disassembly able products. Kinnarps does not focus on flat packages and it compensates this issue with the blankets solution. Blankets shape the product form while permitting to fit in more products than with standard packages. Also important is the fact that it takes less time to install the furniture at the customer premises due to its partial or full assembly. Rail transportation is considered an environmentally friendly way to transport goods. Kinnarps undertook a great step in environmental support in 2006 when it had established the rail transportation, but still the main shipment mode relies on trucks.

Recycling and disposal is not something new for Kinnarps. All wastes are collected organized in specific containers and then transmitted to the departments which use them or deliver to other companies in need of these materials. The biggest achievement in recycling was made in 1977 when Kinnarps introduces briquette manufacturing from the wood wastes. Briquettes are used to produce energy which replace circa 2400 m3 oil and warm not only Kinnarps facilities but also a school, a sport hall, a bank and other private house households. This company became a real asset for Kinnarp village – it "warms" it. As such, while recycling and disposal is largely used in this company the re-use and re-

manufacture is somewhat limited by specific production and customer factors. Kinnarps is engaged in charitable projects of donation obsolete furniture or its components to schools from Africa (i.e. Waste to Wonder). The problem with re-using is hidden in the complexity to retrieve the obsolete furniture from old suppliers. Product durability may last till 15 years; as such tracking and saving the records about sold products also are being wiped out.

Greening the internal and external business environment. Introducing eco-objectives to the employees is an important managerial implication in greening the supply chain. Employees' attitude and routine is directly influencing the environmental performance. A great example of the environmental achievements of employees' activity and internal efficiency of the operations is the comparison of the charts presented below. The first chart (Figure 5.1) presents an increasing level of production from 1988 till 2010 while the second chart (Figure 5.2) suggests a constantly decreasing level of pollution. Since 1988, the use of solvents has declined by 89%, while the production rose by 235% during the same period These facts speak about the increasing demand for Kinnarps products and also the increasing capability, employee skills and routines to lower the emissions rate. The production level was obviously impacted by the introduction of robots, who work continuously without food and sleep. The question is whether they are as much environmentally friendly as humans.

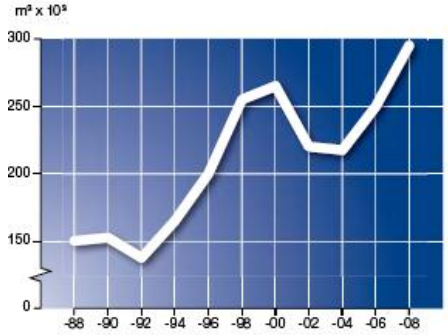

Figure 5.1 Production Volume 1988-2008.

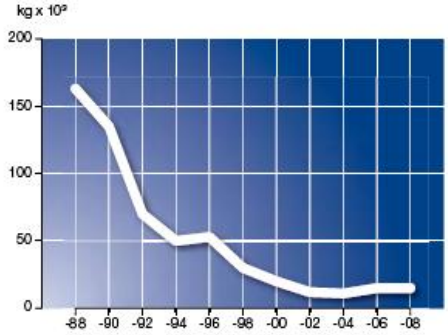

Figure 5.2 Solvent emissions 1988-2008.

(Kinnarps Environmental Report, 2008)

Management practices outside the company are nevertheless as much important as other components. Kinnarps pays much attention to its supplier relationship. It organizes systematic meetings, forums, trainings, collaborations with suppliers and encourages their environmental awareness. So far 200 of their supplier have certified their environmental management systems. Offering environmental awards to suppliers encourages even more their eco efficiency. Still, the large number of suppliers makes more complex the process of communication and controlling. It is impossible to monitor the entire spectrum of suppliers and to control or at least observe their environmental impact. Thus, Kinnarps is looking for decreasing as much as possible the number of suppliers. This would allow Kinnarps to filter the most reliable suppliers and enhance their environmental collaboration as well. With fewer suppliers it is much easier to share information, to control the provenience of raw material and to be agile to the market demands.

Other management issues. There are many other environmental issues which should be addressed through strategic policies over the whole supply chain. For example, Kinnarps promotes the idea of minimum inventory of finished goods over its supply chain by following the demand driven manufacturing - make to order. This approach enables a more efficient consumption of resources throughout the supply chain but in the same time it requires a constant stock of raw materials. At this point we can mention several

collaborations and partnerships Kinnarps undertakes in order to develop green solutions for the most acute environmental challenges: The International Union for Conservation of Nature (IUCN), Naturskyddsföreningen, Green Standards, Världsnaturfonden (WWF), SP Trätek, Forêt, Cellulose, Bois-construction, Forest Stewardship Council (FSC). These findings confirm the serious attitude Kinnarps engages when it comes to environmental responsibility.

Greening the supply chain for Kinnarps implies involvement of many actors, activities and performance measurements (Van Hoek, 1999). The actors are suppliers, Kinnarps and customers, while the activities are those related to greening the amalgam of logistic and production operations. Measurement of environmental performance is an essential tool for controlling and improving. Kinnarps presents its measurements in the annual environmental reports (Kinnarps Miljöredovisning, 2008) available on their website. The open presentation of these measurements entails company's concern and responsibility for the environment and also the proof that Kinnarps is striving to decrease as much as possible its negative impact.

Nonetheless, it is very important to measure and control the suppliers' impact, since they are part of the process of greening the supply chain. The possibility to monitor a large amount of the suppliers is little even if Kinnarps include only those from group A. Another issue, here, is brought by Vachon & Klassen (2006) who claim that the integration level of the supply chain influences the efficiency of green practices called environmental collaboration and environmental monitoring. It says that the more integrated level involves a lower environmental monitoring and increases the environmental collaboration. In Kinnarps case there is a high strive for environmental collaboration due to long term relationship with suppliers which means in the same time a low monitoring level over suppliers' environmental impact. Still, it seems to be a proper solution because of the large number of suppliers and a good trade-off between integration and monitoring level. It also allows suppliers to become collaborative not because of the controlling tools but because of their aim to integrate more into the supply chain.

Kinnarps' relationship with suppliers is very important since they form the first tier in the supply chain while the achievement of green procurement initiates the process of greening the supply chain (Huang & Keskar, 2007). Henry Jarlsson statement "the best way to attack a problem is at source" confirms the firm attitude towards greening the supply chain from its roots. It entails a transition from reverse logistics suggested by Van Hoek (1999) since the company has transferred its focus from recycling and waste management towards procurement. The main achievement in this field is imposing the supplier to fulfill specific requirements related to their raw material. Absence of carcinogen, inhibitive of reproduction, mutagenic chemicals, and exclusion of chrome, nickel, heavy metals and solvents are some of the specification to be obliged. Other requirements involve reusability, recyclability aspects. Kinnarps declare to know the origin of all it raw materials. This is true when it comes to group A suppliers (e.g. wood, wool) but whether it is possible to track the origin of all other supplies, we do not know. That is merely because Kinnarps works also with intermediary suppliers or agents and the origin of those supplies may take to Far East or other places where the environmental standards are not so strict. For this purpose Kinnarps tests all supplies in its R&D facilities but the problem may rely on the fact that the quality of some supplies varies over the time while the tests are run periodically.

Greening the procurement in Kinnarps is possible not directly because of its big size as Min & Galle (2001) stated, but mostly because this size implies a bigger power over the buyer-seller relationship and thus a possibility to influence and control the suppliers.

Government regulations are also more severe on bigger companies since their environmental impact is proportionally bigger and thus adopting green purchasing strategies is more likely to occur. Kinnarps is aware of the environmental and social responsibility it carries but also it understands the economical benefits of being green - e.g. re-use of blankets, recycle into energy (Porter & Van der Linde, 1995). It also recognizes that public purchasing is the right instrument to push the market into the right direction (Kinnarps Miljö, 2010).The company has a pro-active approach to purchasing policy if we classify according to Noci (1997). This is because Kinnarps engages its suppliers in developing green products and in following its environmental requirements (e.g. chrome free supplies). On the other hand not all suppliers are subjected to the same requirements: from aproximately 200 suppliers only Group A and B can be included in such strategy. Thus it means that other suppliers are subjected to the reactive approach, which makes sure that suppliers comply with the environmental standards. Environmental compliance of the suppliers with the standards is shown by quantitative estimation of the environmental impact they produce and this facts can be found in environmental reports or attested by the EMS. The question is how to evaluate those suppliers who due to the little size or other reasons do not possess the proper information.

Managerial implications are very important in adopting green policies. The interviewed persons were top managers from purchasing, logistic, transportation and R&D department and they create a strong profile of managers who understand the unique opportunity to include the environmental responsibility into efficient performance. They encourage green purchasing policies and believe it is good both for the environment and for the company. Preuss (2005) presents series of factors that constraint the purchasing decisions of managers. One of the internal factors important here is the senior management which is formed by a family. The family that owns and manages the company has endeavored from the very beginning the environmental responsibility with a correct attitude and encourage until now the continuous improvement. Their consent and guidance feed the environmental attitude of the whole company. Kinnarps managers are indeed followers of this attitude but in the same time the total power of decision is not upon them thus the green purchasing decisions rely on the senior board (i.e. family) shoulders. Constraints from other departments like R&D, finance and logistics also limit the ability of purchasers to initiate stricter environmental supplier selection. Legal requirements in Kinnarps are addressed very seriously and obviously are included in purchasing decision making. Customer is another constraint which set up the environmental preferences of the product while competitors are constraint themselves by the Kinnarps green image.

5.2 Kinnarps supplier evaluation analysis

From the previous research question we have pointed out that environmental concerns (De Boer, 1998) have been included, naturally, at early stages of Kinnarps creation and continued to be addressed until now in the process of greening the supply chain. Supplier selection and evaluation are critical for green purchasing achievement and necessitate to be organized and adapted correctly to the company profile.

5.2.1 RQ2: How does Kinnarps evaluate its suppliers and which green criteria are included in this evaluation?

According to Noci (1997), pro-active purchasing strategy, pursued by Kinnarps Company, requires to analyze the supplier capacity to support product innovation and to respond in time to any eco requirement. In the same time some suppliers are dealt with reactive purchasing strategies which ensure the compliance with the environmental standards.

Therefore a trade off model is required to ensure the environmental evaluation of all suppliers.

The relationship with the suppliers is build with a long term vision (Christine Salven, purchasing manager) thus the evaluation system should be constructed on strong attributes which would uphold the relationship and will eliminate the threat brought by Vachon and Klassen (2006). The integration level of the supply chain should balance the environmental collaboration and monitoring level over the suppliers.

The presented five models in the second chapter (Noci, 1997; Enarsson, 1997; Handfield et al 2002; Humphreys et al, 2003, Lee et al, 2009) provide a rich base to create a tailored model. Many of criteria suggested by those authors are included in Kinnarps evaluation model and many are recognized as important but not yet taken so much into consideration because of the time and effort consuming aspects. One of the major criteria of evaluation, presented by Kinnarps, remains to be the cost. Cost is usually not included in the presented models exactly because of the major importance it owns and it becomes a filter in the process of supplier evaluation. Quality is another traditional factor presented by Kinnarps which should include also environmental aspects: absence of harmful components or low rates, durability, recyclability, how the product was manufactured and under what conditions. Other environmental concerns are verified through the presence of environmental management systems (EMAS; ISO, etc.) or through checking the criteria included in the Kinnarps Environmental Policy (pollution control, resource consumption). Furthermore, Kinnarps evaluates the operational routines of the suppliers and thus may discover the presence of environmental competencies.

Besides all these criteria there are many other criteria related to the supplier management, supplied materials, competencies to produce and deliver and presence of EMS. The Conceptual Pyramid (fig. 2.9) is a good framework that incorporates all the criteria. Moreover it presents a scheme of how greenness should develop in a company: first the management becomes environmentally aware, than they encourage green product development, which in its turn should determine which green competencies are needed and the last one comes to check and verify the environmental performance of the company. Thus if Kinnarps would take this model as an evaluation model for its suppliers than it would ensure an comprehensive evaluation of all suppliers green profile and also ensure the environmental monitoring on long-term level (Vachon & Klassen, 2006).

Nevertheless, environmental collaboration, which is made through supplier involvement in trainings and projects, allows Kinnarps to take a deeper look into the supplier environmental attitude and to evaluate their management and competencies. The problem is that not all suppliers are included in this collaboration and especially, for them is necessary to ensure a better environmental monitoring. The fact that Kinnarps aims to reduce suppliers' number speaks not only about reducing costs or time but also about the possibility to improve the environmental monitoring and collaboration with suppliers.

Presence of Environmental Management Systems is a good advantage but it is not a mandatory criterion to be fulfilled. Many authors consider that sometimes certification of EMS are a waste of time and money while the environmental performance is not necessarily improved (Preuss, 2005). Kinnarps seems to agree with this argument and evaluates first other features presented above than EMS. Environmental Pyramid (Fig. 2.10) sets the EMS criteria at the top of the pyramid pointing out that this is not the most important thing when evaluating suppliers rather the other below three building block are

important to achieve the ultimate one. This is another argument of the compatibility of this model with Kinnarps profile.

Supplier evaluation process is also supported by the stipulations of Kinnarps Code of Conduct. This Code specifies the environmental concerns that should be addressed by suppliers and it states that suppliers are obliged to forward it to their own suppliers. Thus the environmental criteria are transferred upstream the supply chain. The concern is whether all the suppliers forward these norms. If not than the supplier evaluation model should detect these fails in forms of lower quality of products due to supplier's supplier inappropriate control.

Another observation is the strict environmental attitude over its own suppliers. Kinnarps ask even more compliance from these suppliers than from others and they could be established as model suppliers.

Supplier evaluation is not always an unpleasant process, especially because Kinnarps provides regularly awards for the most environmental suppliers. Thus it encourages the upstream environmental awareness and also creates a pleasant atmosphere when it comes to environmental evaluation process.

Other environmental concerns may relate to the evaluation of other types of suppliers or partners. A company that tends to green the entire supply chain should take into consideration also the suppliers of administrative goods, foodstuff, etc. Their evaluation and monitoring fulfills the environmental profile of a company. The Environmental Pyramid can be applied also for the evaluation of the suppliers with complementary products (i.e. electricity, sound, specific devices), since they are integrated in Kinnarps office solutions and obviously contribute to its green image.

Environmental evaluation of the suppliers is very important to ensure the constant quality of the supplied products and also to detect the problems that may cause variation. Either when selecting a new supplier or evaluating an old one, the objective is the same- to control the suppliers' conformance and to ensure the continuous process of greening the supply chain.

5.2.2 RQ3: What are Kinnarps' expectations regarding suppliers' green compliance and what is the actual suppliers' attitude regarding environmental issues?

In order to analyze the difference between Kinnarps expectations regarding different environmentally attributes from their suppliers and supplier view on the same environmental attributes the authors will present a general description of the answers received from Kinnarps and then from Kinnarps suppliers with analysis.

The data gathered from Kinnarps top managers also presents which block scored higher. The block "Green product design" and "Green competences (to manufacture and deliver)" score higher with an average of 4.06 each, meaning very important. On the other side, two other blocks "Environmentally oriented management and company" and "EMS and Regulatory compliance" scored in the middle of being "important" and "very important" (3.47 and 3.5).

Individually each environmental attribute had scored very different. The lowest importance Kinnarps top managers look at is "Suppliers green image on the market" scoring 2.67 or between "somewhat important" and "important". The highest importance is given to

attributes as "Possibility to recycle", "Possibility to disassembly", "Product disposability", "Product durability", "Optimized loads", "Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)" and "Resource consumption control (energy, water, material consumption)". All of them scored 4.33, meaning that are "very important" and at least one out of three Kinnarps manager classifies those attributes as most "important". Furthermore, other attributes have been seen as "very important" like: "the environmental support of supplier's senior management", "the environmental awareness of their purchasing, production, logistics managers", "possibility to re-use" and "green packaging".

On the other side, supplier's top manager answers from the chapter "B" of the survey are presented in the appendix 9. The total average of the answer from suppliers is between "important" and "very important" general view on different environmental attributes. The total general score of the suppliers (3.63) is almost equal to the total average of the expectations form the Kinnarps managers (3.77), which can lead to a general answer that suppliers attitude compliance on Kinnarps expectations are met.

Further researchers will look closer into comparing answers from each building block from the Environmental Pyramid. Supplier's general answer on four different blocks is more or less similar. Each of the blocks scored between 3.46 and 3.76, consequently presents a view between "very important" and "important" for all environmental compartments. The blocks "Environmentally oriented management and company" and "EMS and Regulatory compliance" scored slightly higher in the supplier's answers (by +0.12 and +0.21). Suppliers overall view on regulatory compliance and environmental management orientation of the company is presented slightly higher than the Kinnarps requirements for the suppliers on those blocks. However, both sides presented as being between "important" and "very important". On the other side, Supplier's answer on the blocks "Green product design" and "Green competencies (to manufacture and deliver)" scored lower than Kinnarps top management expectations (by –0.60 and -0.30). Kinnarps seems to have a higher expectation on product design from the suppliers, scoring the block as "very important" compared with the middle side of "important" and "very important" of the supplier's attitude. Kinnarps also seems to have a slightly higher expectation from the suppliers on manufacturing and delivery of the green competences.

Regarding the answers received from the suppliers on each attribute separately it shows that all attributes scored from "important" to "very important" and slightly more than that. Even if the general answer between the Kinnarps top managers and Kinnarps suppliers are the same, some attributes as "Suppliers green image on the market" scored very different. Kinnarps doesn't pay such great attention on suppliers green image as suppliers do. With a difference of 1.10, Kinnarps suppliers scored 3.77 (close to "very important"), however, Kinnarps managers give the lowest mark to this attribute 2.67 (between "somewhat important" and "important"). Other two more attributes scored higher in supplier's answers: "Green process planning, monitoring and control" and "Regulatory and legal compliance regarding environment". Suppliers see green process planning, monitoring and control as being between "important" and "very important", scoring 3.47. Still, Kinnarps managers see this attribute "important" as but not more than that. Regulatory and legal compliance towards environment is also seen different with a variation of 0.60 Kinnarps managers see it between "important" and "very important". On the other side Suppliers see it as "very important" and even more (13 suppliers out of 30 that answered, seen this attribute as "most important"). Furthermore, there are some attributes that suppliers see less important than Kinnarps do. An important difference in views is illustrated in the

attributes "Possibility to disassemble" and "Product disposal". Kinnarps expect that suppliers must pay a "very important" attention or even more to product disassemble. On the other side suppliers see this attribute between "important" and "very important". Also, Kinnarps expect that suppliers will pay a higher attention to product disposal, seen it as "very important" or higher. On the other side suppliers see this attribute also as between "important" and "very important". Two other environmental attributes scored lower in suppliers answers: "Possibility to re-use" and "Green packaging". Kinnarps expect that suppliers will see the possibility to re-use as "very important" while suppliers see it between "important" and "very important". Same balance of Kinnarps expectation and suppliers view characterizes for the green packaging attribute. Kinnarps expect that supplier will see green packaging as "very important" while suppliers see it between "important" and "very important". Other attributes scored more or less close to each other, both the Kinnarps view about suppliers and Kinnarps supplier about themselves. Moreover, some attributes in both sides scored as "very important" and higher like: "Product durability", "Optimized loads", "Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)" and "Resource consumption control (energy, water, material consumption)". Also important to mention the attribute "possibility to remanufacturing" – that is seen as "important" for both Kinnarps managers and Kinnarps suppliers managers.

It is understandable from the survey analysis that Kinnarps pays a higher attention to the product design and its possibility to be transported more efficient, that is why their expectation on those attributes are higher. In the same time the suppliers see their product as a final product for them and do not try to pay such big attention towards recycling or reuse. According to the purchasing manager Kinnarps is trying to have in general less suppliers, due to high prices of maintaining a strong relationship with them. Indeed, 54 main suppliers is a high number for the main suppliers and if Kinnarps want to have a strong relationship with them, in order to manage, they need to have a big procurement department and this cost a lot of resources. Consequentially, the reduction of the suppliers will lead to a higher sharing of information and that's why is important to pay more attention to the level of interaction with supplier.

Kinnarps must collaborate with their suppliers to send a message regarding the importance of the product characteristics and to ask for more environmental awareness regarding the green product design and other general competences. The message sent here is that there is not enough to care about complying with the regulation and to have a good image on market is also necessary to achieve a high level of understanding the importance of reusing, recycling, product disposal, possibility to be disassembled, green packaging and loads optimization. In this way Kinnarps will make their customers to be more aware of the attributes that are very important for Kinnarps.

5.2.3 RQ4: How suppliers can be grouped based on the environmental attitude?

In order to analyze this question we will need to have a look at the questions answered only by Kinnarps suppliers. Questions from Chapter A and B from the supplier's questionnaire will be analyzed. First of all, authors will look at discrepancies between answers given by Swedish and International suppliers. The figure 5.3 presents the distribution of the main suppliers based on three different general criteria: country of residence, the volumes bought by Kinnarps from Suppliers and presents of any environmental certification. Based on the graph can be seen that all suppliers that depends more on Kinnarps (having Kinnarps as a major customer) are from Sweden and all of them are environmentally certified. The graph also presents that a big part of the main suppliers from Sweden are

certified. On the other side, the main suppliers coming from abroad, a bit more than half are environmentally certified. In general two third of the suppliers (20 out of 30) are environmentally certified and based on the questionnaire answers some of the suppliers that are not yet certified, have specified that they are working on implementing environmental certification in the coming years.

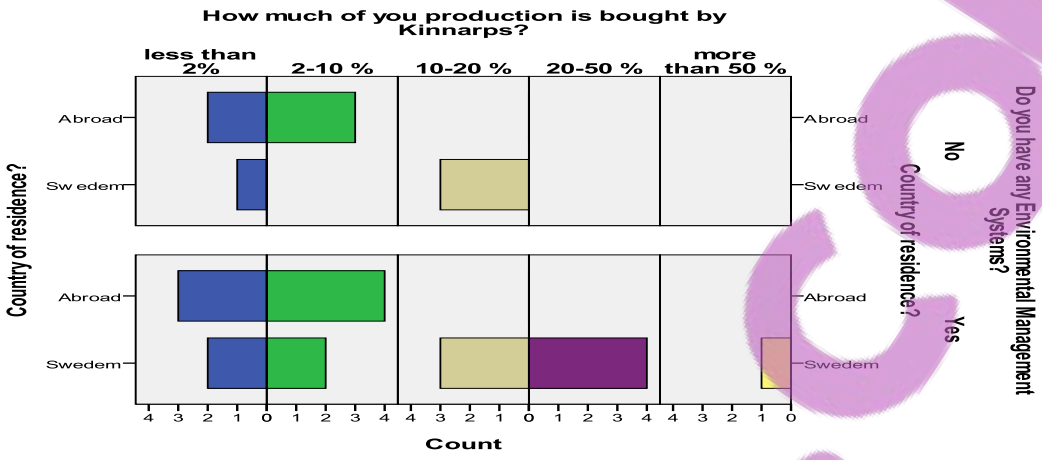

Figure 5.3: Distribution of the main suppliers based on three different general criteria: country of residence, the volumes bought by Kinnarps from Suppliers and presents of any environmental certification.

Also, the majority (2/3) of the suppliers say that green image on the market is very or most important for them, but this is not what Kinnarps sees to be as very important.

Figure 5.4 show that suppliers pay a very important attention to their image on the market. However those suppliers that have Kinnarps as their main customer (sell more that 20% to Kinnarps) do not pay such a high importance to it as other suppliers do. In the figure 5.4 the red circle shows that most of the suppliers that sell in big quantities (from their company perspective) have a long relationship with Kinnarps (more than 10 years) and don't pays such a big attention to their green image on the market, categorized as "important" only same as Kinnarps do.

Only one company from the group of those who Kinnarps is a main customer, but its collaboration is less than 5 years, said that green image of the market is - very important. As appendix 8 presents, all those suppliers for which Kinnarps is a main customer are from Sweden and all of them are environmentally certified.

In the same figure 5.4 we can see that the majority of the companies that sell not so much to Kinnarps (less than 10 %) look at their green image on the market as being very important or more, different from what Kinnarps requires. All those companies have a relatively long relationship with Kinnarps (longer than 6 years).

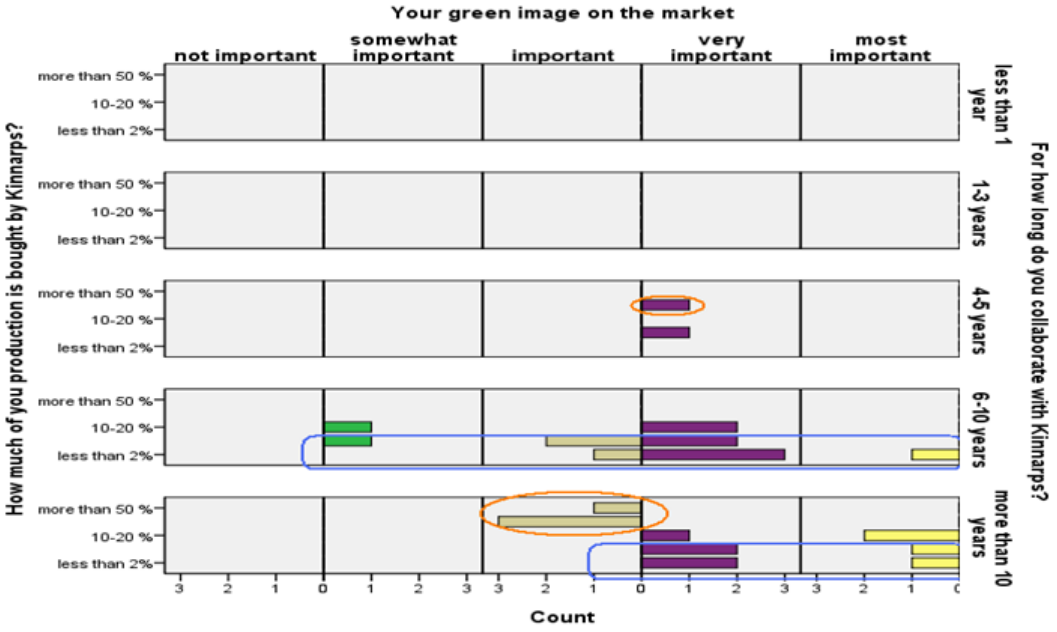

Figure 5.4 Distribution of the main suppliers based on three different general criteria: green image on the market, the volumes bought by Kinnarps from suppliers and the length of the collaboration with Kinnarps.

This suggest that the attitude to give the same importance to green image both from Kinnarps and their suppliers needs two general ingredient: a high dependence on the customer and to be environmentally certified. If the supplier will depend more on Kinnarps they will tend to have an environmental certification and probably will have the same attitude towards different environmental attribute, or at least will know each other better.

5.2.3.1 Cluster analysis

In order to start analysis in SPSS software, we must adjust the data. By adjustment is understood the process of managing the missing values. The answers from suppliers are presented in appendices 8 and 9, and few of them missed to give an answer to a particular question.

The technique used to find the missing values is called Expectation Maximization (EM). This technique is the most used in data analysis due to a higher reliability than other techniques. This technique is described more in Schafer (1997) and Schafer & Olsen (1998). SPSS software was used to find the missing values using EM technique. Below the table shows the missing values for four questions of the set of 21under analysis, from four different companies.

Table 5.1 Missing values calculated based on Expectation maximization technique

QB1d	QB2e	QB3d	QB4a
3.04	3.54	3.11	3.74

After the missing values have been introduced into SPSS the cluster analysis can begin. The cluster analysis is a group of multivariate techniques whose primary purpose is to group objects (in or case suppliers) based on the characteristics they possess (Hair et al., 2010). The grouping in cluster analysis is based on the proximity between their answers. The suppliers will be classified based on their environmental attitude similarities. The result of the cluster will reveal high internal (within cluster) homogeneity and high external (between clusters) heterogeneity. The focus of cluster analysis is on the comparison of supplier's environmental attitude, but not the estimation of the attitude itself. The average procedure linkage was selected to do the clustering of the suppliers. In this procedure similarity is based on all members of the cluster rather than on a single pair of extreme members and are thus less influenced by outliers (Hair et al., 2010). This procedure is a compromise between single- and complete-linkage methods. The dendrograme presents the graphical representation of the clustering process, the closer distance between combinations indicate greater homogeneity.

The appendix 11 presents the first supplier classification as the dendrograme shows all suppliers have been grouped in the end in one big cluster in the last stage (right side of the figure from appendix 11). However during the process of classification in different moments of time all 30 suppliers are grouped in different clusters, the number of companies in one cluster grows with the number of iterations. Determining the number of clusters must be done by researchers, depending on the interpretation of the cluster solution. The researchers face a trade off: fewer clusters and less homogeneity within clusters versus a large number of clusters and more within group homogeneity (Hair et al., 2010). Dendrograme shows that clustering process begins with two suppliers of the same company ([redacted]). In the next phase [redacted] joins them and so on till the last supplier ([redacted]) is grouped. "[redacted]" is the supplier with a total different behavior regarding environmental attitude. In order to group the supplier a blue line was drawn on the dendrogram (appendix 11). As figure presents three main groups have been formed. First group from [redacted] till [redacted] (marked with a blue-marine color in the chart) is composed of 14 suppliers, the second group from [redacted] till [redacted] (marked with red color) is composed from 4 suppliers and the third group from [redacted] till [redacted] (marked with the yellow color) is composed of 10 suppliers. Two other companies: [redacted] and [redacted] are not grouped in those groups. Those two suppliers behave different in their attitude compared with the ones in the groups and between themselves as well. In appendix 12 the result of the dendrogram (suppliers groups) is presented in a table with the survey answers on their attitude regarding environment.

Looking into the dendrograme from appendix 11, it shows two companies that have a very different behavior in their answers. [redacted], is characterized with a different behavior than others suppliers. Even if the total score is the same as for group one, the variances between attributes are very high, from "not important" to "most important" and this in only one block of the questionnaire – "green product design". The last supplier, which is characterized according to the dendrograme result as the most different one in attitude compared with other suppliers, is [redacted]. This suppliers as we can see in the appendix 12, pays zero attention to the attribute "Regulatory and legal compliance regarding environment" compared to most of the suppliers that seen this attribute as "most important".

In order to ensure validity of the classification obtained the researchers run again in SPSS the hierarchical cluster analysis without those two companies that cannot be grouped. In

the figure below the outcome of the dendrogram confirms the formation of 3 main groups containing the same companies as a part of the cluster.

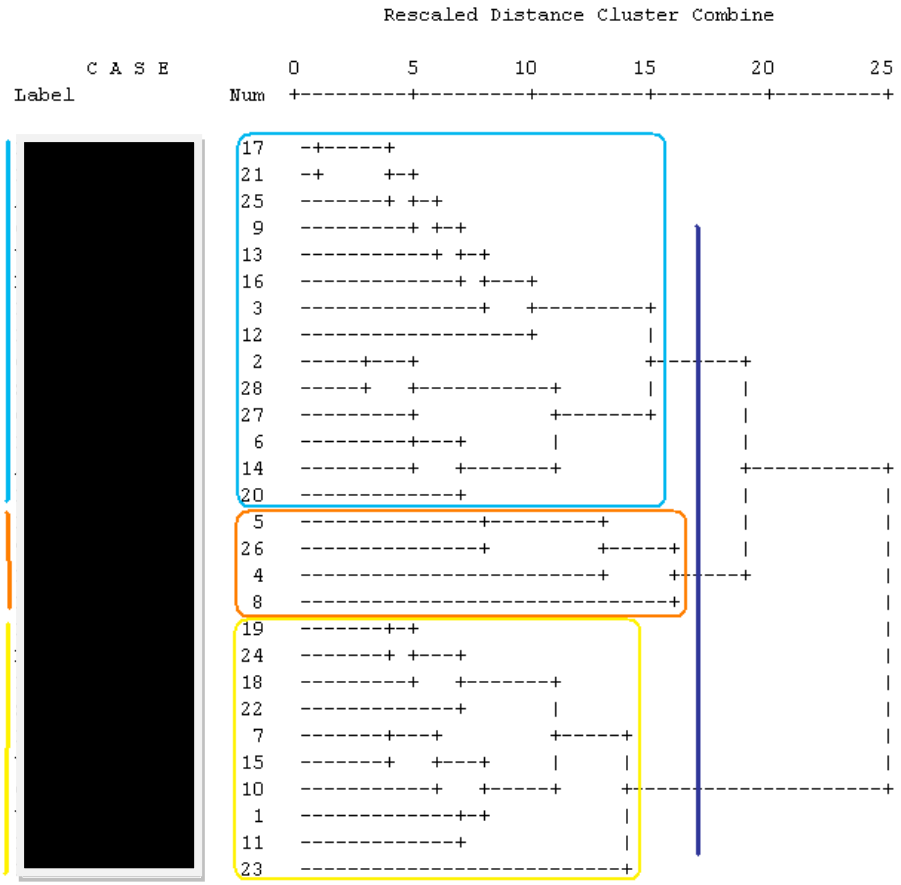

Figure 5.2 Second Suppliers classification dendrogram using average linkage procedure (between groups).

The biggest group (blue-marine color group) is characterized by a high environmental attitude compared with group 3. Most of them have an "important" and "very important" attitude towards different environmental attributes. In this group are 14 suppliers: 10 Swedish and 4 non-Swedish (three Germans and one from UK) and only 3 out of 14 suppliers do not have any kind of environmental certification. The suppliers in this group are characterized with relatively low variances in their answers.

The smallest group (red color group) is characterized by a moderate environmental attitude compared to other suppliers. The answers vary mainly from "not important" to "important". In this group are 4 suppliers, 2 Swedish and 2 non-Swedish (Italy and Czech R.) and half of them do not have any kind of environmental certification. For instance Swedish [redacted], is characterized with a very low attitude towards environmental attributes, the attributes that scored very- or most important for other suppliers like: "Environmental certification (e.g. EMAS; ISO140001) and Presence of green procurement standards" scored "not important" for [redacted]. Same [redacted] from Italy answered to the same attributes with only "somewhat important". Both companies do not have any kind of environmental certifications and with this kind of attitude is hard to believe that they are planning to get it.

The yellow group is characterized by a very high environmental attitude compared with other groups. Most of them have a "very important" and "most important" attitude

towards different environmental attributes. In this group are 10 suppliers: 5 Swedish and 5 non-Swedish (four Germans and one from Poland) and six out of four suppliers have some types of environmental certification. The suppliers in this group are also characterized with relatively low variances in their answers.

Cluster analysis helped us to divide the suppliers in three main groups:

1. The third group (yellow) can be labeled as "*Kinnarps suppliers with a very high environmental attitude*", this group is formed out of 1/3 of the total suppliers that answered the questionnaire.
2. The second group (blue-marine) can be labeled as "*Kinnarps suppliers with a high environmental attitude*", almost half of the suppliers (14) that answered to the questionnaire belongs to this group.
3. The third group (red) can be labeled as "*Kinnarps suppliers with a moderate environmental attitude*", only four suppliers belong to this group.

The validity of the clustering analysis must be regarded descriptive. The cluster technique will always form clusters regardless of the "true" existence of the any structure in the data and cluster solutions should not be generalized (Hair et al., 2010). However, authors believe that this classification can represents all Kinnarps main suppliers, with few exceptions. Some companies can have a totally different behavior in their answers and that why they will not be included in any group.

6 Conclusion

This chapter is the last chapter which presents the final remarks and findings related to the purpose of these research and its research questions. It summarizes the main ideas, creates a synthesis of the findings from analysis chapter and suggests further possible researches.

Greening the supply chain is an often used term to describe the process of including environmental issues in supply chain management. This is a current threat and opportunity for business environment since it implies drastic changes. It can enable a company to become successfully environmentally friendly or it can finish its existence. As any process, greening the supply chain has a beginning and an ending stage. This research focuses on the initial stage of greening due to the belief that any problem should be attacked at its source. Thus procurement, or more specific, supplier selection and evaluation stay at the root of greening process. The purpose of this research was to take a deeper look into the process of supplier evaluation from an environmental angle, namely using the "Environmental Pyramid" model. Kinnarps Company is a 68 years old office solutions company whose experience and performance was found to be as much as possible appropriate for such an investigation. Its thick portfolio of suppliers and aim for long term relationships offers a rich platform to start this study journey with.

RQ 1 → The overall process of greening the Kinnarps supply chain has been found to be an inherent part of its history and as in many other companies it started with the implementation of reverse logistics and green packaging as part of the pro-active environmental approach. Recycling and disposal is a widespread operational routine while blankets' utilization ensures package multi-reusability. Re-use and re-manufacture of furniture is somewhat limited by production- , customer- and long durability factors. The increased environmental awareness of top managers and owner-family has directed the company towards the value seeking approach which includes green product design and green internal and external business environment. Systematic product design, rail transportation, environmental trainings, re-use of wastes in charity purposes, sharing energy obtained from waste briquettes and collaborations with "green" NGOs are normal components of Kinnarps value seeking vision and environmental policy. However, the process of greening the supply chain is yet in development and there is place for improvements in order to replace the pollutant road transportation, to increase product disassembly, to involve more supply chain members into environmental trainings and collaborations. The enumerated constrains and other from R&D, Logistics, and finance department limit the Kinnarps' managerial implication in greening the supply chain. However, customer preferences, legal requirements and senior board vision are major stimulators towards greening process.

Green procurement is a current issue which is addressed by Kinnarps through a pro-active purchasing policy. It requires from suppliers a specific environmental conformance and engages them in product design. Kinnarps strategic aim for environmental collaboration with suppliers increases the risk for a lower environmental monitoring. This concern is possible to be solved only through systematic evaluation of suppliers' environmental performance.

RQ 2 → Kinnarps regular supplier selection and evaluation includes the traditional criteria: cost and quality. Cost criterion supported by quality constitutes the filter stage before

further evaluation. Environmental concerns are included in quality sub-criteria and imply the compliance with environmental standards, diminution and/or elimination of specific harmful components, etc. EMS is not a compulsory criterion but increases the environmental evaluation result of the supplier. Other criteria are related to the traditional financial criteria of the supplier and exploit supplier operational capabilities which may involve environmental competences. Even if a specific environmental evaluation model for supplier is not yet adopted, suppliers commit to follow Kinnarps environmental policy and to forward it to their own suppliers. Environmental trust and commitment are two ingredients that support the long term relationships between Kinnarps and its suppliers.

The "Environmental Pyramid" is a conceptual framework for environmental selection and evaluation of suppliers at 4 levels: company level, product level, competence level and regulatory/standard compliance level. The pyramid presents a summarized approach of the environmental supplier evaluation criteria found in remarkable study researches. The environmental criteria included in the pyramid are structured and organized in four building blocks according to authors view and understanding of the supplier evaluation topic. It allows a comprehensive evaluation of supplier environmental performance and ensures a balanced environmental collaboration and monitoring. The model was nevertheless developed for answering to the next research questions.

RQ 3 → To understand Kinnarps environmental requirements and expectations from its suppliers and also to compare with the environmental attitude and awareness of suppliers the authors has used the environmental criteria included in the "Environmental Pyramid" to develop a 5 point Likert scale questionnaire. The questionnaire and the pyramid are composed out of four main environmental blocks with different attributes that describes each block. According to the analysis part, in general Kinnarps expectations and suppliers compliance are equal. However, suppliers pay attention towards some attributes that Kinnarps do not require, and vice versa. For instance the block that describes green product environmental attributes. Suppliers do not pay as much attention to it as Kinnarps will want to, the same for the block environmental competences. In the same time suppliers are trying to focus more on their image on the market and regulatory / legal compliance regarding environment. Suppliers must pay a bigger attention to the product environmental characteristics – since the product is what Kinnarps buy.

The lack of communication between Kinnarps and all suppliers can be a factor in transferring the right environmental attitude. The large amount of suppliers and especially of the main suppliers does not offer enough time to Kinnarps to have a very strong contact with them. A more frequent communication will provide the suppliers with a right attitude, and this time can be won by reducing the supplier's amount.

RQ 4 → The research made on 30 Kinnarps main suppliers reveals that the majority of Swedish suppliers sell an important amount of their production to Kinnarps and all of them are environmentally certified. In general 20 out of 30 suppliers have some type of environmentally certification, mainly ISO 14001. The analysis has revealed that most of the suppliers pay a very high importance to their green image on the market, in opposition with what Kinnarps expect (not so high). However, the suppliers that sell more than 20% to Kinnarps have the same attitude toward green image as Kinnarps expect.

The last part of the research was analyzing the possibility to cluster the suppliers that answered the survey. With the help of SPSS software 28 out of 30 suppliers have been grouped in 3 main clusters that have been named according to the environmental attitude.

Two suppliers were not included into final cluster analysis based on their very different answers compared to other suppliers.

Table 6.1 will provide the cluster name and the description of the cluster. For more detailed information regarding the suppliers answers and clustering can be found in the appendix 12.

Table 6.1 Kinnarps main suppliers cluster description

Cluster name	Cluster Description
Kinnarps suppliers with a very high environmental attitude. (10 suppliers)	Suppliers characterized with a very high environmental attitude. Their answers for the most attributes included in the survey were "very important" and "most important".
Kinnarps suppliers with a relatively high environmental attitude. (14 suppliers)	Suppliers characterized with a high environmental attitude. Their answers for the most attributes included in the survey were between "important" and "very important".
Kinnarps suppliers with a moderate environmental attitude. (4 suppliers)	Suppliers characterized with a moderate environmental attitude. Their answers for the most attributes included in the survey were close to "somewhat important" and "important".

6.1 Further research

For the duration of writing this research paper different research possibilities can be developed based on the quantitative data that exists. First of all a census of all suppliers regarding the environmental attitude will be necessary to accomplish. In this way all suppliers can be grouped according to the classification revealed above in this paper. A new cluster analysis can be generated in order to see the formation of new clusters. Furthermore, with those complete data a factor analysis can be run in SPSS to group the variables (environmental attributes) according to suppliers' view. The factor analysis will test the "Environmental Pyramid" attributes and will rearrange those 21 attributes in appropriate blocks. Moreover, SPSS software can further help to see the correlation and regression between and of different environmental attributes. How a specific attribute is influenced by others or how it influences others are questions that can be further examined.

Secondly, later on in time, the same questionnaire will be interesting to send to those suppliers that respond to this research and to compare the current attitude with the one in future. This will help us to see how the attitude of suppliers is changing over time. Also, the data gathered from all suppliers will help to have a clear description of differences between Swedish and non-Swedish suppliers with regard to environmental attitude. Similar studies in other companies are encouraged to be accomplished in order to see if the attitude to particular attributes differs in the same way as for Kinnarps and their suppliers. And finally, other statistical methods can be used to check if the same result will be revealed.

There are many interesting area of study that can be researched based on the data authors have collected, so that others researchers can use the data to provide new theory to the topic of environmental supplier evaluation.

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Appendix 1 Summary of main research articles used in developing a literature review and their input to the theoretical framework.

Authors	Theoretical input
Supply Chain Management	
Beamon et al (1999)	Extended supply chain
Hervani et al (2005)	Green Supply Chain Management Performance Measurement System
Kopicki et al. (1993)	Three approaches to implement environmental policies
Tsoulfas and Papis (2006)	Prescriptive approach of the environmental principles
Van Hoek R.I. (1999)	Steps towards greening the supply chain
Walton et al. (1998)	Environmental Supply Chain Management
Vachon and Klassen (2006)	Supply Chain Integration
Managerial Implications	
NOC (2001)	Definition of Purchasing manager
Preuss (2005)	Various constraints on purchasing managers
Bowen et al (2001)	Research among purchasing managers
Green Procurement	
Russel (1998)	Green procurement definition
Min and Galle (2001)	Factors which influence green procurement adoption
Shrivastava (1995)	Descriptive approach of green procurement
Noci (1997)	Environmental purchasing strategies
Supplier Environmental Evaluation	
De Boer et al, 2001	Major developments that determine inserting environmental criteria
Lee et al (2009)	Supplier evaluation criteria and subcriteria
Noci, (1997)	Qualitative evaluation criteria for proactive strategies
Enarsson (1997)	Supplier evaluation from an environmental perspective using Ishikawa's fishbone diagram
Handfield et al (2002)	Framework for environmental performance attributes used in AHP model
Humphreys et al (2003)	Environmental framework for incorporating environmental criteria into the supplier selection process

Appendix 2 Structure of the questions asked to purchasing and R&D manager from Kinnarps at the second Company interview.

1. How many suppliers do you have?
2. How do you classify suppliers? What method?
3. Where are they located?
4. How often do you select new suppliers or evaluate your old suppliers?
5. Which are the most important criteria in selecting a new supplier? Cost, quality, delivery time or environmental aspects?
6. Do you include environmental criteria in selecting /evaluating suppliers?
7. Which environmental criteria do you look at?
8. Do you have a specific process of selecting suppliers? A specific model? Environmental model?
9. Who is taking care of transportation of the raw materials or components part? Suppliers or Kinnarps?
10. How would you evaluate your relationship with different suppliers?
11. What do you understand by the word designing new green products?
12. How easily can your products be disassembled?
13. How many Kinnarps products can be re-used or re-cycled?
14. What packaging is used to transport the component parts or raw materials?
15. Do you have access to information regarding environmental aspect of the suppliers?
16. What is the medium life time of the Kinnarps product?
17. How would you consider the life time of the products produced by Kinnarps is longer than the one of the competitors?
18. How would you consider the suppliers capability to meet Kinnarps expectations? High or low?
19. What are the main expectations from a supplier?

Appendix 3 *Survey questions - questions from "chapter A" (for suppliers).*

A. General information about the company.

1. How many employees does you company have?

10-49	50-99	100 - 499	500 - 999	≤ 1000
○	○	○	○	○

2. For how long do you collaborate with Kinnarps?

Less than 1 year	1-3 years	4-5 years	6-10 years	more than 10 years
○	○	○	○	○

3. How would you evaluate your relationship with Kinnarps?

Very weak	Weak	Normal	Strong	Very strong
○	○	○	○	○

4. What is the distance between your company (factory) and Kinnarps headquarters ?

≥99 km	100-499 km	500 - 999 km	1000 - 4999 km	≤5000 km
○	○	○	○	○

5. How much of you production is bought by Kinnarps?

Less than 2%	2%-10%	10%-20%	20%-50%	more than 50 %
○	○	○	○	○

6. Does Kinnarps AB own some shares in your company?

No	Yes 0.1%-10%	Yes 10.1%-50%	Yes50.1%-99.9%	Yes 100 %
○	○	○	○	○

7. Do you have any Environmental Management Systems? Please indicate which.

_____

Appendix 4 *Survey questions - questions from "chapter B" (for suppliers).*

B. How important are the following attributes in order to manufacture and deliver green products and also to attract green buyers?

Grading / Attributes	Not important	Somewhat Important	Important	Very important	Most important
	1	2	3	4	5
1. Environmentally oriented Management and Company					
a. The environmental support of senior management	○	○	○	○	○
b. The environmental awareness of purchasing managers, production and logistics managers.	○	○	○	○	○
c. Your green image on the market	○	○	○	○	○
d. Your proximity to the buyer or possibility to locate closer	○	○	○	○	○
e. Green information availability, sharing and environmental training	○	○	○	○	○
2. Green Product Design					
a. Possibility to re-use	○	○	○	○	○
b. Possibility to recycle	○	○	○	○	○
c. Possibility to re-manufacture	○	○	○	○	○
d. Possibility to disassemble	○	○	○	○	○
e. Product disposal	○	○	○	○	○
. Product durability	○	○	○	○	○
3. Green Competencies (to manufacture and deliver)					
a. Green packaging	○	○	○	○	○
b. Green choice of transportation	○	○	○	○	○
c. Optimized loads	○	○	○	○	○
d. Return loads capability	○	○	○	○	○
e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	○	○	○	○	○
f. Resource consumption control (energy, water, material consumption)	○	○	○	○	○
4. Environmental Management Systems and Regulatory Compliance					
a. Environmental certification (e.g. EMAS; ISO140001)	○	○	○	○	○
b. Presence of green procurement standards	○	○	○	○	○
c. Green process planning, monitoring and control	○	○	○	○	○
d. Regulatory and legal compliance regarding environment	○	○	○	○	○

Appendix 5 *Survey questions - questions from "chapter B" (for Kinnarps).*

How important do you consider are the following attributes of the supplier for achieving green procurement in your company?

Grading / Supplier Attributes	Not important	Somewhat Important	Important	Very important	Most important
	1	2	3	4	5
1. Environmentally oriented management and company					
a. The environmental support of supplier's senior management	○	○	○	○	○
b. The environmental awareness of their purchasing, production, logistics managers	○	○	○	○	○
c. Suppliers green image on the market	○	○	○	○	○
d. Supplier proximity to the buyer or possibility to locate closer	○	○	○	○	○
e. Green information availability, sharing and environmental training	○	○	○	○	○
2. Green product design					
a. Possibility to re-use	○	○	○	○	○
b. Possibility to recycle	○	○	○	○	○
c. Possibility to re-manufacture	○	○	○	○	○
d. Possibility to disassembly	○	○	○	○	○
e. Product disposability	○	○	○	○	○
f. Product durability	○	○	○	○	○
3. Green competencies (to manufacture and deliver)					
a. Green packaging	○	○	○	○	○
b. Green choice of transportation	○	○	○	○	○
c. Optimized loads	○	○	○	○	○
d. Return loads capability	○	○	○	○	○
e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	○	○	○	○	○
f. Resource consumption control (energy, water, material consumption)	○	○	○	○	○
4. EMS and Regulatory compliance					
a. Environmental certification (e.g. EMAS; ISO140001)	○	○	○	○	○
b. Supplier's green procurement standards	○	○	○	○	○
c. Green process planning, monitoring and control	○	○	○	○	○
d. Regulatory and legal compliance regarding environment	○	○	○	○	○

Appendix 6a *Codification of the survey question from chapter "A" for SPSS software.*

Codification of survey data form original answer to codified answers. The codification is necessary for performing the analysis in SPSS. This will help the authors to see the correlations between answers obtained from suppliers. The codification will modify both answers and questions. For example the question 1: "**How many employees does your company have?"** will be codified as – "QA1", and so on for all 7 questions. For answers the codification will look like that: in the first question the answer "10-49" will be codified as – "11", answer "50-99" will be codified as – "12" and so on till answer "≤ 1000" will be codified as – "15". For the second question answer "4-5 years" will get the value – "23" and so on for questions 1 to 6. In question 7 will get only two values: "70" – if the company doesn't have any environmental certificate and "71" – if at least one environmental certificate exists. One more questions

Original survey for suppliers.	Codified survey answers of the suppliers.
A. General information about the company.	**A. General information about the company.**
1. How many employees does your company have?	**1. QA1**
10-49 ○ 50-99 ○ 100 - 499 ○ 500 - 999 ○ ≤ 1000 ○	11 ○ 12 ○ 13 ○ 14 ○ 15 ○
2. For how long do you collaborate with Kinnarps?	**2. QA2**
Less than 1 year ○ 1-3 years ○ 4-5 years ○ 6-10 years ○ more than 10 years ○	21 ○ 22 ○ 23 ○ 24 ○ 25 ○
3. How would you evaluate your relationship with Kinnarps?	**3. QA3**
Very weak ○ Weak ○ Normal ○ Strong ○ Very strong ○	31 ○ 32 ○ 33 ○ 34 ○ 35 ○
4. What is the distance between your company (factory) and Kinnarps headquarters?	**4. QA4**
≥99 km ○ 100-499 km ○ 500 - 999 km ○ 1000 - 4999 km ○ ≤5000 km ○	41 ○ 42 ○ 43 ○ 44 ○ 45 ○
5. How much of you production is bought by Kinnarps?	**5. QA5**
Less than 2% ○ 2%-10% ○ 10%-20% ○ 20%-50% ○ more than 50 % ○	51 ○ 52 ○ 53 ○ 54 ○ 55 ○
6. Does Kinnarps AB own some shares in your company?	**6. QA6**
No ○ Yes 0.1%-10% ○ Yes 10.1%-50% ○ Yes50.1%-99.9% ○ Yes 100 % ○	61 ○ 62 ○ 63 ○ 64 ○ 65 ○
7. Do you have any Environmental Management Systems? Please indicate which. _____	**7. QA7** 70 ○ 71 ○

Appendix 6b *Codification of the survey question from chapter "B" for SPSS software.*

As presented in the appendix 6.a codification is necessary to perform the analysis in SPSS software. Again both questions and answers from the Chapter B of the survey questionnaire were codified. The codification of the questions will contain letters and numbers. For example: **QB3c** stands for: **Q**uestion from - chapter **B,** block **3**, attribute **c.** (see more examples below). The codification of the answers will be as follow. Since all the questions have to choose a level of importance from not important to most important the codification of the answers will be the same for all questions. Not important – value "1", Somewhat important – "2", important – "3", very important – "4" and most important – "5".

Original survey for suppliers.	**Codified survey answers of the suppliers.**
B. How important are the following attributes in order to manufacture and deliver green products and also to attract green buyers?	**B. How important are the following attributes in order to manufacture and deliver green products and also to attract green buyers?**
1. Environmentally oriented Management and Company	**1. QB1**
a. The environmental support of senior management	a. QB1a
Not important ○ Somewhat important ○ Important ○ Very important ○ Most important ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
b. The environmental awareness of purchasing managers, production and logistics managers.	b. QB1b
Not important ○ Somewhat important ○ Important ○ Very important ○ Most important ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
c. Your green image on the market.	c. QB1c
.....	.....
2. Environmentally oriented Management and Company	**2. QB2**
a. Possibility to re-use	a. QB2a
Not important ○ Somewhat important ○ Important ○ Very important ○ Most important ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
b. Possibility to recycle	b. QB2b
.....	.....
4.Environmental management system and regulatory compliance	**4.QB4**
d. Regulatory and legal compliance regarding environment	d. QB4d
Not important ○ Somewhat important ○ Important ○ Very important ○ Most important ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○

Appendix 7 Survey results from Kinnarps top managers.

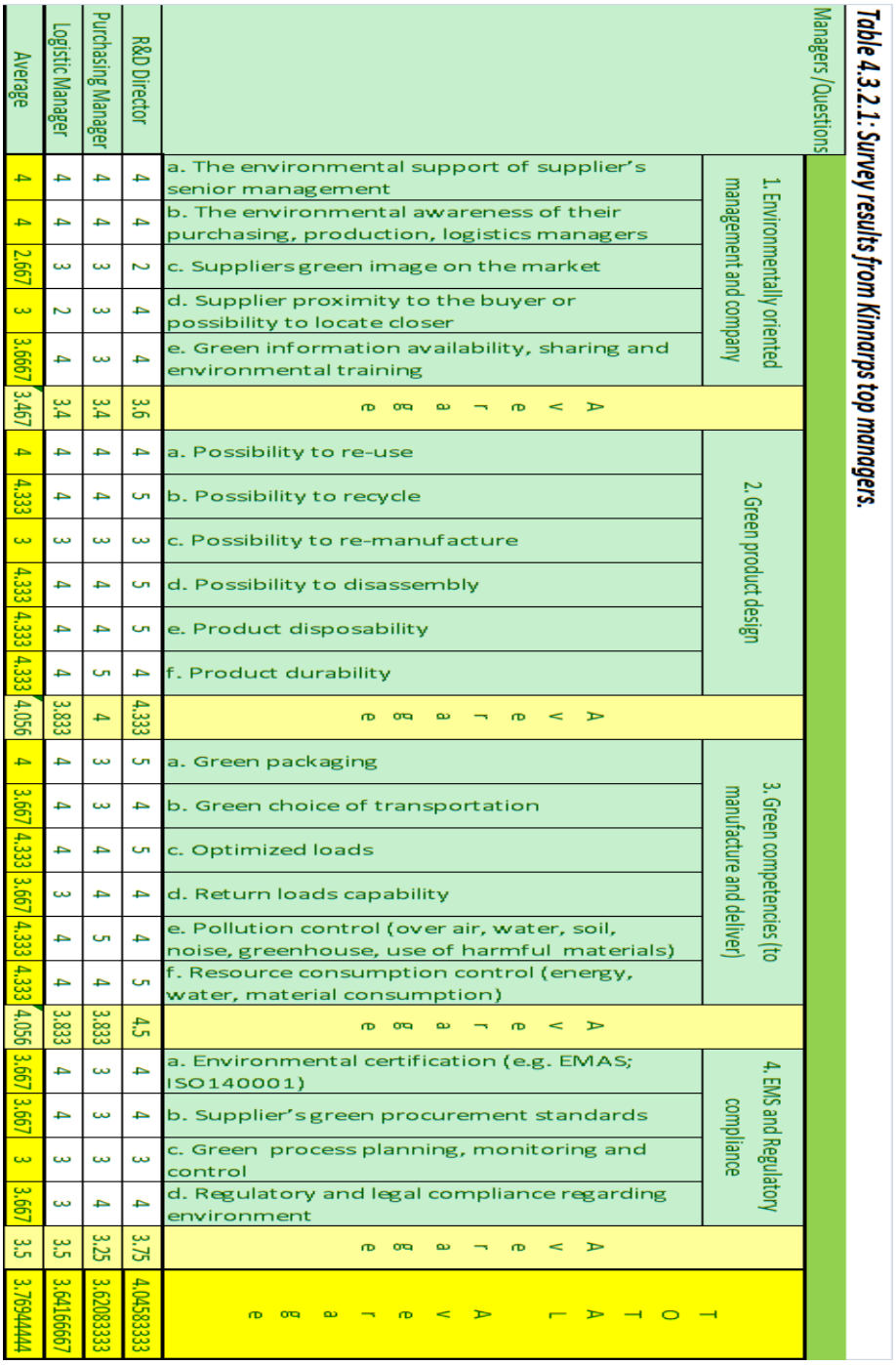


Table 4.3.2.1: Survey results from Kinnarps top managers.

Managers /Questions		R&D Director	Purchasing Manager	Logistic Manager	Average
1. Environmentally oriented management and company	a. The environmental support of supplier's senior management	4	4	4	4
	b. The environmental awareness of their purchasing, production, logistics managers	4	4	4	4
	c. Suppliers green image on the market	2	3	3	2.667
	d. Supplier proximity to the buyer or possibility to locate closer	4	3	2	3
	e. Green information availability, sharing and environmental training	4	3	4	3.6667
	Average	3.6	3.4	3.4	3.467
2. Green product design	a. Possibility to re-use	4	4	4	4
	b. Possibility to recycle	5	4	4	4.333
	c. Possibility to re-manufacture	3	3	3	3
	d. Possibility to disassembly	5	4	4	4.333
	e. Product disposability	5	4	4	4.333
	f. Product durability	4	5	4	4.333
	Average	4.333	4	3.833	4.056
3. Green competencies (to manufacture and deliver)	a. Green packaging	5	3	4	4
	b. Green choice of transportation	4	3	4	3.667
	c. Optimized loads	5	4	4	4.333
	d. Return loads capability	4	4	3	3.667
	e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	4	5	4	4.333
	f. Resource consumption control (energy, water, material consumption)	5	4	4	4.333
	Average	4.5	3.833	3.833	4.056
4. EMS and Regulatory compliance	a. Environmental certification (e.g. EMAS; ISO140001)	4	3	4	3.667
	b. Supplier's green procurement standards	4	3	4	3.667
	c. Green process planning, monitoring and control	3	3	3	3
	d. Regulatory and legal compliance regarding environment	4	4	3	3.667
	Average	3.75	3.25	3.5	3.5
TOTAL Average		4,04583333	3,62083333	3,64166667	3,76944444

Appendix 8 Survey result from Kinnarps main suppliers (answers on Chapter A).

N/O	Company/Questions	A. General information about the company.						
		1. How many employees does you company have?	2. For how long do you collaborate with Kinnarps?	3. How would you evaluate your relationship with Kinnarps?	4. What is the distance between your company (factory) and Kinnarps headquarters ?	5. How much of you production is bought by Kinnarps?	6. Does Kinnarps AB own some shares in your company?	7. Do you have any Environmental Management Systems? Please indicate which.
1	[redacted]	50-99	< 10 years	strong	100-499 km	20-50 %	no	Certified
2		100-499	< 10 years	strong	100-499 km	2-10 %	no	Certified
3		50-99	< 10 years	very strong	100-499 km	>2 %	no	no
4		100-499	< 10 years	very strong	100-499 km	10-20 %	no	Certified
5		50-99	< 10 years	strong	> 99 km	<50 %	no	Certified
6		50-99	< 10 years	strong	500-999 km	10-20 %	no	Certified
7		10-49	< 10 years	strong	> 99 km	>2 %	no	Certified
8		100-499	< 10 years	very strong	100-499 km	10-20 %	no	no
9		10-49	6-10 years	strong	> 99 km	10-20 %	no	no
10		10-49	6-10 years	very strong	> 99 km	10-20 %	no	no
11		10-49	< 10 years	very strong	100-499 km	20-50 %	no	Certified
12		10-49	6-10 years	very strong	100-499 km	>2 %	no	Certified
13		10-49	6-10 years	strong	100-499 km	10-20 %	no	Certified
14		10-49	4-5 years	strong	100-499 km	20-50 %	no	Certified
15		10-49	1-3 years	strong	100-499 km		no	Certified
16		10-49	< 10 years	very strong	> 99 km		no	no
17		10-49	< 10 years	strong	100-499 km	20-50 %	no	Certified
18		100-499	6-10 years	very strong	1000-4999 km	>2 %	no	no
19		100-499	6-10 years	very strong	500-999 km	2-10 %	no	Certified
20		100-499	6-10 years	very strong	1000-4999 km	>2 %	no	Certified
21		<= 1000	< 10 years	very strong	1000-4999 km	2-10 %	no	Certified
22		<= 1000	6-10 years	strong	1000-4999 km	2-10 %	no	no
23		<= 1000	< 10 years	very strong	1000-4999 km	>2 %	no	Certified
24		100-499	6-10 years	strong	1000-4999 km	>2 %	no	Certified
25		100-499	6-10 years	strong	1000-4999 km	2-10 %	no	Certified
26		50-99	6-10 years	strong	1000-4999 km	>2 %	no	no
27		10-49	< 10 years	very strong	1000-4999 km	2-10 %	no	no
28		50-99	6-10 years	very strong	1000-4999 km	2-10 %	no	no
29		100-499	6-10 years	very strong	1000-4999 km	2-10 %	no	Certified
30		100-499	4-5 years	normal	100-499 km	2-10 %	no	Certified

Appendix 9 Survey result from Kinnarps main suppliers (answers on Chapter B).

Table 4.3.2.2.2: Survey result from Kinnarps main Supliers (answers on Chapter B).

N/O	Company/Questions	B. How important are the following attributes in order to manufacture and deliver green products and also to attract green buyers?																									
		1. Environmentally oriented management and company						2. Green product design							3. Green competencies (to manufacture and deliver)							4. EMS and Regulatory compliance					TOTAL Average
		a. The environmental support of senior management	b. The environmental awareness of purchasing managers, production and logistics managers.	c. Your green image on the market	d. Your proximity to the buyer or possibility to locate closer	e. Green information availability, sharing and environmental training	Average	a. Possibility to re-use	b. Possibility to recycle	c. Possibility to re-manufacture	d. Possibility to disassemble	e. Product disposal	f. Product durability	Average	a. Green packaging	b. Green choice of transportation	c. Optimized loads	d. Return loads capability	e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	f. Resource consumption control (energy, water, material consumption)	Average	a. Environmental certification (e.g. EMAS; ISO140001)	b. Presence of green procurement standards	c. Green process planning, monitoring and control	d. Regulatory and legal compliance regarding environment	Average	
1	[redacted]	4	4	3	3	4	3.6	3	3	2	2	2	3	2.5	3	3	4	3	3	4	3.333	4	3	3	3	3.25	3.170833333
2		5	5	4	4	4	4.4	4	4	4	4	4	4	4	4	4	4	3	4	4	3.833	4	4	4	5	4.25	4.120833333
3		3	3	3	4	3	3.2	4	4	3	3	4	4	3.667	4	4	4	4	5	5	4.333	3	2	2	5	3	3.55
4		4	3	4	2	5	3.6	2	3	2	4	3	4	3	3	3	4	2	4	4	3.333	4	3	4	4	3.75	3.420833333
5		4	4	4	3	4	3.8	2	1	1	2	3	3	2	2	3	4	3	4	3	3.167	4	1	1	4	2.5	2.866666667
6		3	4	4	4	4	3.8	4	4	3	3	3	4	3.5	3	3	4	4	4	4	3.667	4	3	2	4	3.25	3.554166667
7		3	3	4	4	3	3.4	3	4	3	4		4	3.6	2	3	3	3	3	3	2.833	4	3	3	4	3.5	3.333333333
8		3	3	3	3	3	3	3	4	2	4	3	4	3.333	2	4	3	2	5	5	3.5	4	3	4	5	4	3.458333333
9		5	5	5	3	4	4.4	4	4	4	4	2	5	3.833	4	4	5	3	5	5	4.333	5	4	5	5	4.75	4.329166667
10		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
11		5	4	4	3	5	4.2	4	5	2	4	4	5	4	4	4	5	3	4	5	4.167	5	5	4	4	4.5	4.216666667
12		4	4	5	3	4	4	5	5	5	5	5	5	5	4	4	5	4	5	5	4.5	4	4	5	5	4.5	4.5
13		3	3	4	2	2	2.8	3	3	2	2	3	2	2.5	3	2	2	2	4	2	2.5	1	1	2	4	2	2.45
14		2	2	2	3	2	2.2	4	4	4	4	4	4	4	4	3	3	3	3	3	3.167	3	2	2	4	2.75	3.029166667
15		4	5	4	5	4	4.4	4	5	5	4	4	5	4.5	4	5	5	4	5	5	4.667	4	4	4	5	4.25	4.454166667
16		3	4	3	3	2	3	4	5	4	4	4	4	4.167	2	3	3	3	4	4	3.167	4	2	3	5	3.5	3.458333333
17		4	5	5	3	3	4	2	5	2	2	2	4	2.833	3	4	5	4	4	4	4	3	3	3	3	3	3.458333333
18		4	5	4	4	4	4.2	2	4	2	2	2	4	2.667	4	4	4	3	3	3	3.5	4	3	4	4	3.75	3.529166667
19		3	3	4	1	2	2.6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	5	3	1	2.75	3.3375
20		5	5	4	3	4	4.2	4	4	3	3	3	5	3.667	3	3	3	3	5	4	3.5	5	4	4	5	4.5	3.966666667
21		5	5	5	2	4	4.2	4	4	4	1	5	4	3.667	5	4	5	5	5	5	4.833		4	5	5	4.667	4.341666667
22		4	4	4		3	3.75	4	5	4	4	4	5	4.333	4	5	5	5	5	5	4.833	5	4	4	4	4.25	4.291666667
23		4	4	3	2	5	3.6	3	4	4	4	5	4	4	4	3	4		4	5	4	5	4	4	5	4.5	4.025
24		2	3	3	2	2	2.4	2	2	2	2	3	3	2.333	3	2	3	2	4	4	3	4	3	4	4	3.75	2.870833333
25		3	3	4	5	4	3.8	1	5	1	1	5	5	3	4	4	5	3	4	5	4.167	3	4	4	4	3.75	3.679166667
26		3	4	3	4	3	3.4	4	4	3	4	4	4	3.833	3	4	4	4	4	4	3.833	4	3	4	4	3.75	3.704166667
27		3	3	2	1	3	2.4	1	2	1	2	3	4	2.167	2	2	2	2	4	4	2.667	2	2	3	5	3	2.558333333
28		3	4	3	3	3	3.2	4	4	3	3	3	4	3.5	3	3	4	4	4	4	3.667	4	3	2	4	3.25	3.404166667
29		4	4	4	1	3	3.2	1	3	1	3	3	5	2.667	3	3	4	1	4	4	3.167	4	3	3	5	3.75	3.195833333
30		4	4	4	2	4	3.6	2	3	2	2	3	4	2.667	3	3	4	2	4	4	3.333	4	4	4	4	4	3.4
	Average	3.7	3.9	3.767	3	3.5	3.592	3.2	3.867	2.9	3.167	3.517	4.133	3.464	3.367	3.5	3.967	3.409	4.167	4.167	3.763	3.828	3.267	3.467	4.267	3.707	3.631293539

Appendix 10 Cronbach's Alpha coefficient for Kinnarps suppliers answers on Chapter B of the questionnaire.

Table: Cronbach's Alpha coefficient for all 21 questions.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.925	.928	21

Table: Cronbach's Alpha coefficient for the block "Environmentally oriented management and company".

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.791	.811	5

Table: Cronbach's Alpha coefficient for the block "Green product design".

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.860	.857	6

Table: Cronbach's Alpha coefficient for the block "Green competencies (to manufacture and deliver)".

Reliability Statistics

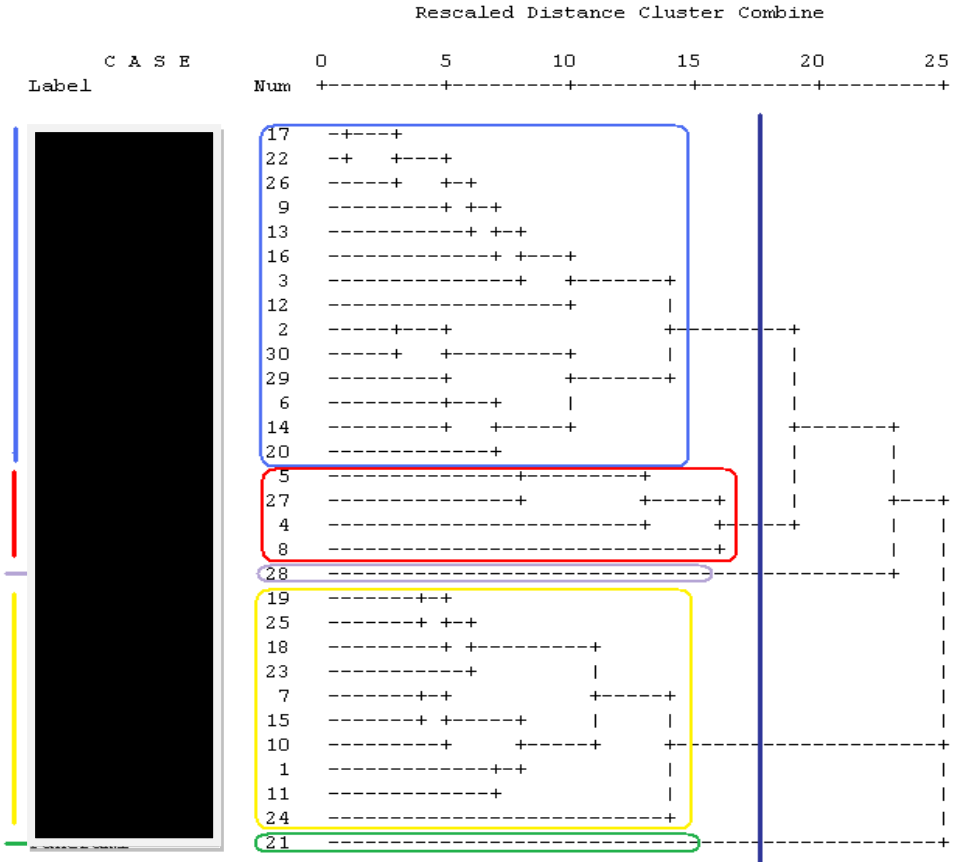
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.878	.880	6

Table: Cronbach's Alpha coefficient for the block "EMS and Regulatory compliance".

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.726	.717	4

Appendix 11 : first Suppliers classification dendrogram using average linkage procedure (between groups).



Appendix 12 First Suppliers classification based on SPSS dendrogram result, using average linkage procedure (between groups).

Group No.	N/O	Company/Questions	B. How important are the following attributes in order to manufacture and deliver green products and also to attract green buyers?																									TOTAL Average
			1. Environmentally oriented management and company						2. Green product design							3. Green competencies (to manufacture and deliver)							4. EMS and Regulatory compliance					
			a. The environmental support of senior management	b. The environmental awareness of purchasing managers, production and logistics	c. Your green image on the market	d. Your proximity to the buyer or possibility to locate closer	e. Green information availability, sharing and environmental training	Average	a. Possibility to re-use	b. Possibility to recycle	c. Possibility to re-manufacture	d. Possibility to disassemble	e. Product disposal	f. Product durability	Average	a. Green packaging	b. Green choice of transportation	c. Optimized loads	d. Return loads capability	e. Pollution control (over air, water, soil, noise, greenhouse, use of harmful materials)	f. Resource consumption control (energy, water, material consumption)	Average	a. Environmental certification (e.g. EMAS; ISO140001)	b. Presence of green procurement standards	c. Green process planning, monitoring and control	d. Regulatory and legal compliance regarding environment	Average	
Group No.1	1	[redacted]	3	4	4	4	4	3.8	4	4	3	3	3	4	3.5	3	3	4	4	4	4	3.67	4	3	2	4	3.25	3.55417
	2		3	4	3	3	3	3.2	4	4	3	3	3	4	3.5	3	3	4	4	4	4	3.67	4	3	2	4	3.25	3.40417
	3		3	4	3	4	3	3.4	4	4	3	4	4	4	3.83	3	4	4	4	4	4	3.83	4	3	4	4	3.75	3.70417
	4		3	3	4	4	3	3.4	3	4	3	4		4	3.6	2	3	3	3	3	3	2.83	4	3	3	4	3.5	3.33333
	5		3	4	3	3	2	3	4	5	4	4	4	4	4.17	2	3	3	3	4	4	3.17	4	2	3	5	3.5	3.45833
	6		3	3	3	4	3	3.2	4	4	3	3	4	4	3.67	4	4	4	4	5	5	4.33	3	2	2	5	3	3.55
	7		3	3	3	3	3	3	3	4	2	4	3	4	3.33	2	4	3	2	5	5	3.5	4	3	4	5	4	3.45833
	8		2	2	2	3	2	2.2	4	4	4	4	4	4	4	4	3	3	3	3	3	3.17	3	2	2	4	2.75	3.02917
	9		4	3	4	2	5	3.6	2	3	2	4	3	4	3	3	3	4	2	4	4	3.33	4	3	4	4	3.75	3.42083
	10		4	4	4	2	4	3.6	2	3	2	2	3	4	2.67	3	3	4	2	4	4	3.33	4	4	4	4	4	3.4
	11		4	4	4	1	3	3.2	1	3	1	3	3	5	2.67	3	3	4	1	4	4	3.17	4	3	3	5	3.75	3.19583
	12		4	4	3	3	4	3.6	3	3	2	2	2	3	2.5	3	3	4	3	3	4	3.33	4	3	3	3	3.25	3.17083
	13		4	5	4	4	4	4.2	2	4	2	2	2	4	2.67	4	4	4	3	3	3	3.5	4	3	4	4	3.75	3.52917
	14		4	5	5	3	3	4	2	5	2	2	2	4	2.83	3	4	5	4	4	4	4	3	3	3	3	3	3.45833
Group No.2	1		2	3	3	2	2	2.4	2	2	2	2	3	3	2.33	3	2	3	2	4	4	3	4	3	4	4	3.75	2.87083
	2		3	3	2	1	3	2.4	1	2	1	2	3	4	2.17	2	2	2	2	4	4	2.67	2	2	3	5	3	2.55833
	3		3	3	4	2	2	2.8	3	3	2	2	3	2	2.5	3	2	2	2	4	2	2.5	1	1	2	4	2	2.45
	4		4	4	4	3	4	3.8	2	1	1	2	3	3	2	2	3	4	3	4	3	3.17	4	1	1	4	2.5	2.86667
	1		3	3	4	5	4	3.8	1	5	1	1	5	5	3	4	4	5	3	4	5	4.17	3	4	4	4	3.75	3.67917
Group No.3	1		4	5	4	5	4	4.4	4	5	5	4	4	5	4.5	4	5	5	4	5	5	4.67	4	4	4	5	4.25	4.45417
	2		4	4	4		3	3.75	4	5	4	4	4	5	4.33	4	5	5	5	5	5	4.83	5	4	4	4	4.25	4.29167
	3		4	4	5	3	4	4	5	5	5	5	5	5	5	4	4	5	4	5	5	4.5	4	4	5	5	4.5	4.5
	4		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	5		5	5	4	4	4	4.4	4	4	4	4	4	4	4	4	4	4	3	4	4	3.83	4	4	4	5	4.25	4.12083
	6		5	5	4	3	4	4.2	4	4	3	3	3	5	3.67	3	3	3	3	5	4	3.5	5	4	4	5	4.5	3.96667
	7		5	5	5	3	4	4.4	4	4	4	4	2	5	3.83	4	4	5	3	5	5	4.33	5	4	5	5	4.75	4.32917
	8		4	4	3	2	5	3.6	3	4	4	4	5	4	4	4	3	4		4	5	4	5	4	4	5	4.5	4.025
	9		5	4	4	3	5	4.2	4	5	2	4	4	5	4	4	4	5	3	4	5	4.17	5	5	4	4	4.5	4.21667
	10		5	5	5	2	4	4.2	4	4	4	1	5	4	3.67	5	4	5	5	5	5	4.83		4	5	5	4.67	4.34167
	1		3	3	4	1	2	2.6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	5	3	1	2.75	3.3375