



**School of Economics And Management
Lund University**

Exploring Green IS Possibilities

Eco innovation planning for private companies

Master Thesis, 15 Credits, Department of Informatics

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ABSTRACT

Green Information System (IS) has become an important topic in IT management research and practice in the last few years due to economic opportunities and increasing pressure from stakeholders. However, many private organizations fail to manage their environmental efforts in an adequate manner since they neglect the strategic aspects of this topic. This paper discloses the strategic relevance of Green IS on the basis of a literature review that refers to fundamental approaches of Strategic Management and Information Systems research and emphasizes the necessity of aligning business, sustainability, and IT domain. The debate is emphasized by a multiple-case study that analyses the Green IS implementation practices of three companies on the basis of semi-structured interviews. The empirical findings of the cross-case analysis indicate that there is no consistent approach for aligning Green IS with corporate sustainability goals and business objectives so far. For that purpose, I conceptualize a Strategic Green IS Alignment Framework and identify four distinct Green IS strategies. The proposed framework is supposed to provide guidance for decision-makers in selecting an appropriate Green IS strategy that contributes to the achievement of corporate sustainability targets and leverages competitiveness.

Keywords: *Green IS, Strategic Alignment, Sustainability, Strategy, Environmental Strategies, Competitive Advantage.*

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1. INTRODUCTION

1.1 Background

We are all reading about IT organizations and companies becoming “greener” – the impact of information technology (IT) on and the role of Information Systems (IS) in ecological sustainability have emerged as key IT management issues and as an IS research field. It seems like more companies and governments are now taking a step further to incorporate “green” into every element of their core business and bottom line results. The idea of “green” or “environment” as a stand-alone entity is disappearing while each aspect of the business works to implement more sustainable practices in their everyday operations. “Green IT” is an expression that indicates a new research field that investigates all the environmental and energy issues related to IT (Murugesan, 2008).

Over the last several years, the term “Green IT and IS” has begun to be used to describe a field at the juncture of two trends. The first trend involves the growing concern about environmental issues across many human communities. For an example, A survey of 49,243 teens from around the world revealed that 74 percent of them “believe that global warming is a serious problem and are more concerned about it than any other issue including drugs, violence or war” (Greenpeace, 2007). This and many other recent cultural phenomena reflect a growing awareness of the impact that humans and our activities have on the world. The term “Green” has become connected with this sense of awareness; the word choice is based on the primary color of plant leaves and reflects a concern for the ecosystems in which humans exist. The second trend involves IT and IS, the use of digital tools and techniques for manipulating information, and the social phenomena that surround these systems.

The term ‘Green IS’ is distinguished from ‘Green IT’. ‘Green IT’ focuses mainly on energy efficiency and equipment utilization. Green IS should have a greater potential than Green IT because it tackles a much larger problem. In the context of Green IT the term Green IS referring to:

“the design and implementation of information systems that contribute to sustainable management processes” (Boudreau et al., 2008 p. 2).

IS can play a key role in making organizations and communities more sustainable while at the same time reducing the negative environmental impact of IS and associated IT infrastructure. Green IS may refer to three different research areas: ‘Energy efficiency of IT’, ‘IS for the management of environmental risks and ‘IT as an enabler of green governance’. The mixed impact of the global recession and climate change is having a significant effect on information systems. In addition to the unavoidable budget cuts that accompany a slow economy, terms like “Green IS” and “Green IT” are finally finding their way into boardrooms, forcing IT departments to clean up their environmental acts.

Green IS management is an integral part of the Information Technology world. Green IS management aims at delivering incremental benefits to the organization by both seeking alternatives to costly processes, and optimizing the overall IT landscape in its energy envelope (power consumption, heat generation, air-conditioning requirements) through a constrained set of strategic objectives. Green IT is being used to reduce the impact of IT on the environment and also to improve efficiency of resources in

information systems. All this refers to the sustainability of current resources for the wellness of society and enterprises. Nowadays businesses, enterprises and organizations are becoming more and more devoted to environmental issues due to tougher environmental legislation, economic and other influences as well as an increasing concern about the environment among the general public. In a competitive and global setting, companies need to understand to care for the environment as part of their operations (Brorson et al., 2006).

In an organization, the challenge to be sustainable depends on making Green IS management find ways to reduce the overall cost and will also provide enough power for a longer period of time. This will in return increase the efficiency of an organization on the long run as IT managers do not have to worry about power utilization or scarcity of resources in later life span of an organization.

1.2 Problem Area and Research Question

For most organizations, green information technology (IT) is associated with concepts like reduced energy consumption, recycling disused products and waste, eliminating hazardous substances and reducing carbon footprint. Green IS can also imply practices that purchase technology to reduce business travel, use of shared resources such as cloud computing and resource optimization like virtualization. Several studies have identified motives for company/organization "greening," such as regulatory compliance, competitive advantage, stakeholder pressures, ethical concerns, critical events, and top management initiative (Dillon & Fischer, 1992; Lampe, Lawrence & Morell, 1995; Winn, 1995). Climate debate and sustainable growth addresses energy use which in turn throws the spotlight on power consumed by Information technology (IT). Since information management has become pervasive in modern society, the impact of IT on energy budget is becoming more and more significant. The growth in the number of servers to manage companies' invaluable data and the increasing complexity of the network infrastructure has caused an enormous spike in electricity usage. Nowadays, service centers alone consume 1.5% of the power produced in the US and are projected to reach 4.5% within 5 years. Another issue related to energy consumption which is influencing IT decisions in many countries has been the introduction of carbon taxes connected with CO₂ emissions and the carbon credits debate. There is a strong need for new instruments being able to analyze the impact of IT decisions and IS management processes on energy and costs together with setting an active control on Information Systems (IS) on the basis of energy driver.

In the current market situation most companies would barely argue against the need to take a greener approach. A big portion of the companies in the world are making the Environmental sustainability as the part of their Global Strategy and some of them going green to fulfill customers' requirements or increase customer confidence(NASSCOM,2009). But it's one thing to encompass greener activities and another thing entirely to practice it while growing revenues and profit margins. In order for a Green IS strategy to be effective in companies or organization, it's substantive to incorporate sustainable practices into both product lifecycle and Project and Process management.

Green IS and IT Expected to Become More of an Organizational Priority Over Next 2 years

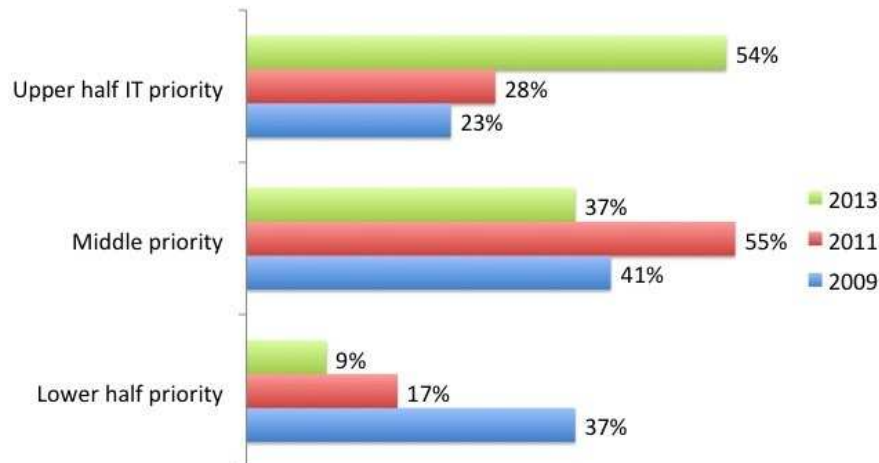


Figure 1.1: ComTIA,2nd Annual Green IT Insights and Opportunities, January 2011¹

Recent study on green IS found that organizations and companies are increasingly viewing green as a critical factor when building and evaluating their IT infrastructure. More than three-quarters (76%) of U.S. organizations have developed at least a partial green IT strategy, compared with just 60% of organizations in last year's study(CompTIA,2011).

This study is designed to investigate how Green IS can be enforced in small businesses and private companies. Further more, IS and IT managers are presented with opportunities to investigate and provide solutions for how the innovative use of IT and IS can transform and reduce the environmental impact of individuals, organizations and society and thus provide leadership in sustainability. The Green IS explores the impact and role of IT and IS in sustainability initiatives. Reports revealed that the insight of possibilities and marketing the value of Green IT and IS are further ahead in the private sector (Exido, 2008) and it was found that many consulting companies use environmental issues in marketing to appeal new employees and customers (Lorusso, 2008). In Sweden more companies and organizations increasingly look at potentials and opportunities in using ICT to environmental technology (Exido, 2010).

Research Questions

Sustainability goals, the interrelation of business strategy and IT constitute a complex challenge which simultaneously implies great opportunities for environmental protection and economic progress. Notwithstanding, Green IS initiatives are recently limited to operational cost reductions whereas holistic Green IS strategies that can create competitive advantage and sustainable, profitable growth can hardly be found (Hart 1997; Hart & Milstein 2003). To leverage the full potential of environmentally-friendly IT systems, it is necessary to align the Green IS measures with the competitive environmental strategy. Even

¹ The graph is based on survey, conducted by ComTIA organization in January 2011.

so, little research about Green IS alignment has been conducted so far. Contributing to the research concerning the strategic relevance of Green IS, I addressed the main question at issue for this master thesis was:

- Why and how do organizations implement Green IS measures?

To facilitate the process of finding the answer to the main question the following sub question was formulated:

- How can Green IS optimally support competitive environmental strategies in private organization?

The term “Green IS measures” refers to the way a company manages its IT assets along with analyzing how IS can support a green physical system in organization and private companies. It includes purchasing energy-efficient IT equipments such as desktops, notebooks, servers and other IT equipments, as well as managing the power consumption of those equipments. It also adverts to the environmentally safe disposal of that equipment, through recycling or donation at the end of its lifecycle. In addition to, Green IS will give a clear understanding of how IT and the use of IT can reduce organizations environmental impact while also bringing commercial benefits.

1.3 Goal

The goal of this study is to examine how do small companies and private organizations implement Green IS measure in terms of "going green" and, in doing so, to explain a model that IS can play a key role in making organizations more sustainable while at the same reducing the negative environmental impact of IS and associated IT infrastructure. Hence this study will focus on the role that IS can play in these two interrelated issues of Green IT and Green IS. The concept of corporate sustainability and Green IS refers not to what a firm should do, but to the initiatives that reduce the firm's "ecological footprint" (Ewing et al. 2010). The operation of IT systems comes along with considerable carbon dioxide (CO₂) emissions that drive climate change while the demand for data processing and storage capacities is continuously rising. Thus the implementation of Green IS practices that enhance energy efficiency and the consequent application of environmental technologies that substantially decrease IT-related CO₂ emissions are urgently needed (GeSI 2008). Green IS is acknowledged as a strategic technology that will play a fundamental role in reengineering of business and production processes to reduce the environmental footprint of organizations (Watson et al. 2010). Besides, Green IS practices can induce cost savings and the utilization of environmentally-friendly technologies often has a positive return on investment (Harmon et al. 2010).

Green IS can support low-cost strategies or facilitate competitive differentiation on the basis of environmental initiatives. As a consequence, Green IS has the potential to create competitive advantage in the business and sustainability domain and should be addressed as a strategic issue (Zarrella 2008). The interrelation of IT constitutes, business strategy, and sustainability goals a complex challenge which simultaneously implies great opportunities for environmental protection and economic progress.

However, Green IS initiatives are recently limited to operational cost reductions whereas holistic Green IS strategies that can create competitive advantage and sustainable, profitable growth can hardly be found (Hart 1997; Hart & Milstein 2003). To leverage the full potential of environmentally-friendly IS systems, it is necessary to align the Green IS measures with the competitive environmental strategy. Even so, little research about Green IS alignment has been conducted so far. To conduce to the research concerning the strategic relevance of Green IS, I specify Sustainability and Green IS responsiveness as a set of corporate initiatives aimed at mitigating small business organization and private companies' impact on the natural environment and how Green IS support competitive environmental strategies. These Green IS initiatives can include changes to the firm's products, processes, and policies, such as reducing energy consumption and waste management system, using ecologically sustainable resources, and focusing mainly towards a green approach to the use of information and application in Information Systems at a software and management level, rather than on the development of the underlying hardware infrastructure.

1.3 Delimitations

This study is mainly aimed for intended audience such as IT Managers/IT professionals/IT Executives of various companies and so on who are interested in reassessing Green policies into their management level. The right set of strategies can turn the green challenge into a competitive advantage for the company (NASSCOM, 2009). Since the empirical data only based on 2 companies in developing country and therefore Green IS measure could be different in developed countries. The Green IS environmental strategies are also vast so as a consequence the integration of sustainability and Green IS measure with the Green IS development is subject to testing and continuous improvement in both developing and developed countries.

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

2.1 Understanding the need for Green IS

Climate change and going green is the latest catchword of the business world. After globalization and a spurge of increase in the production facility all around the world, impact on nature and environment is increasingly felt. This change is well recognized by almost all the major developed and developing countries. In this day and age, our world is mostly driven by the machines controlled by computers; green technology is not just the latest trend but the need of the hour. In this pace, Green IS is an initiative taken by the companies all around the world to reduce the harmful impact of technology on the environment. Apart from most of the technology and software/IT organizations, manufacturing and servicing firms are also taking a peek into it. Addressing global warming is a responsibility we take very seriously at Microsoft.(SteveBallmer CEO, Microsoft)

There are many different classes of IT, in terms of both the information systems that exist such as software packages, databases, and networks and the devices that people and institutions use to access these systems such as desktop computers, laptop, servers, mobile phones, and personal digital assistants. Humans inhabit the growing information ecologies that result from this abundance of devices and systems (Nardi & O'Day, 1999). The rapid acceptance of IS, is transforming societies around the world, affecting many different aspects of human life, from communication between individuals to the needs of international politics. For better understanding of Green IS below factors should be considered.

2.1.1 Green IT

Green IT brings together, environmental issues and IT, and explores the ways in which they connect to each other. In particular, it examines the opportunities for IT to address issues related to the global ecosystem. The rapid growth and acceptance of IT worldwide suggests that this area may be a fruitful one in which to seek possibilities for environmental change, building on other transformative societal effects which are already underway. It is important to note that not all facets of IT are environmentally favorable. Computation is beginning to occupy a nontrivial amount of the power consumption around the world, and electronic waste (e-waste) is a fast-growing concern.

According to the Gartner report by the following definition of green IT is an appropriate term defined in the context of an enterprise.

"Green IT is the optimal use of information and communication technology (ICT) for managing the environmental sustainability of enterprise operations and the supply chain, as well as that of its products, services and resources, throughout their life cycles." (Mingay, 2007)

Green IT has become increasingly mainstream over recent years; providers are now beginning to move into IT for green. IT for green represents a profound shift from the data center and distributed IT activities that predominantly characterized green IT. This requires not only a change in service offering but also a shift in the portfolio and go-to-market strategy of vendors and service providers going beyond helping the

IT organization to becoming an enabler of a corporate wide, holistic vision of sustainability (Green IT Summit, 2011). Green IT or green computing refers to environmentally sustainable computing or IT. In the article *Harnessing Green IT: Principles and Practices*, Murugesan defines the field of green computing as

"the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—such as monitors, printers, storage devices, and networking and communications systems—efficiently and effectively with minimal or no impact on the environment." (Murugesan, 2008, p. 24-33).

According to a report by the Gartner research firm, the IT sector emits CO₂ at a rate approximately equivalent to that of the airline industry (Mingay, 2007). This rate is growing rapidly, especially in the mobile computing area. Nevertheless, according to *Smart 2020*, a report by the Climate Group (2008) on behalf of the Global e-Sustainability Initiative, the potential positive environmental benefits enabled by IT are five times as great as the environmental footprint of IT. Given the inherent complexity of environmental issues and the ineffective ways humans currently live, innovations in IT across many aspects of society can have a strongly positive net environmental impact. The environmental opportunities demonstrated by IT systems are both external and internal to the IT field itself. Externally, Green IT can have an effect on areas from economics (von Weizsäcker & Lovins, 1998) to ecological monitoring (Szewczyk et al., 2004) to the details of people's everyday lifestyles. Internally, Green IT can help reduce the impact of e-waste (Grossman, 2006; Hightower, Smith, Sonnenfeld, & Pellow, 2006), enable sustainable interaction design (Blevins, 2007), and decrease energy consumption by computational systems.

2.1.2 IT for Green

The concept of "IT for Green" emerged as a way to talk about the positive impact that IT could have on the environment. Breakthroughs such as telepresence² or videoconferencing, hardware virtualization, Cloud computing, and remote applications like vehicle fleet management or mobile meter reading had all made their debut. Each promised qualitative benefits for the environment. For example, traditionally highly polluting companies could install telepresence rooms in order to speak of their environmental efforts in their annual reports. This move from "Green IT" to "IT for Green", is signifying a positive and measurable contribution by Information Systems to the reduction of greenhouse gas emissions. The goals of this concept are; reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote the recyclability of defunct products and factory waste. Research continues in the key areas such as making the use of computers as energy-efficient as possible, and designing algorithms and systems for efficiency-related computer technologies.

² **Telepresence** is far superior to conventional videoconferencing: users experience a life-like meeting, enabling them to interact as if they were in the same room.

2.2 Definition and drivers of Green IS

Green IS has become the latest buzzword in business organization although a common understanding of the coverage and scope is still missing in research and practice (Velte et al. 2008). An overview of current research on Green IT and Green IS is provided by Molla (2009) as well as the journal “*Green IS: Building Sustainable Business Practices*” by Richard Watson (2008). The author argues that most of the researchers widely used the terms *green*, *eco-efficiency* and *sustainability*. In this study I apply the term *green* to specify the analysis and minimization of environmental impacts. This specification of *green* differs from the term *sustainability*, which is far-reaching (see section 2.2) and refers to the balanced consideration of economic, environmental and social aspects (Erek et al. 2009). Therefore, the process of corporate *greening* can be understood as a first step towards the superior goal of sustainability (Molla 2009). In line with, I define *Green IS* as follows:

“Green IS incorporates the concept of Green IT and comprises a greater variety of possible initiatives to support sustainable business processes. In addition, it is the systematic application of practices that enable the minimization of the environmental impact of IT, maximise efficiency and allow for company-wide emission reductions based on technology innovations.” (Watson et al. 2010, p. 22-38)

Green IS is supposed to significantly decrease the environmental footprint of the IT industry and other business organization to foster environmental innovations in other industry sectors (Dutta & Mia, 2010). One of the current key challenges of Green IS and Green IT is to advance from uncoordinated cost-cutting investments to consistent Green IS strategies that leverage the full potential of innovative environmental technologies (Harmon et al. 2010; Olson 2008).

The major drivers for Green IS adaptation in companies’ level are presented in below table 2.1 Bansal and Roth (2000) identify four major drivers of environmental initiatives: economic opportunities, stakeholder pressure, legislation and ethical motives. This sorting scheme is applied to structure, the list of drivers of Green IS initiatives that were identified in the available literature. Now a day, the most invaluable driver for the implementation of Green IS measures is the reduction of operational costs. The improvement of IT and IS efficiency is vital since the demand for computational and storage capacities is ever-increasing while energy prices are rising and stakeholders are demanding for responsible business practices. It is still a crucial and positive return on investment for Green IS initiatives since the strategic potential is not recognized so far (Olson 2008). This spotlights the need for a holistic Green IS strategy approach that aims at the creation of competitive advantage on a more profound basis.

Table 2.1 Overview of drivers of Green IS initiatives.

Motivation	Driver	Source
Economic opportunities	1. Cost savings	Accenture (2009); Bansal & Roth(2000); Watson et al. (2010); Harmon & Auseklis(2009); Hart & Milstein (2003); Info-Tech (2009); Skinner (2009); Zarnekow et al. (2009); Zarrella(2008)
	2. Revenue Growth	
	3. Prevent resource restriction	
	4. Risk reduction	
	5. Innovation	
	6. Repositioning	
Stakeholder pressure	7. Emission and waste reduction	Accenture (2009); Bansal & Roth (2000); Esty & Winston (2009); Hart & Milstein (2003); Info-Tech (2009); Nunn (2007); Zarnekow et al. (2009); Zarrella (2008)
	8. Reputation	
	9. Media attention	
Legislation	10. Regulatory compliance	Esty & Winston (2009); Harmon &Auseklis (2009); Hart & Milstein (2003); Info-Tech (2009); Zarrella (2008)
	11. Legitimacy	
Ethical motives	12. Corporate citizenship	Bansal & Roth (2000); Nunn (2007); Zarrella (2008)
	13. Top management	
	14. Company values	

2.3 Sustainability and Corporate strategy (As a new dimension)

The term sustainability definition originates from the WCD (1987):

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
(Bansal 2005, p. 717-736)

Sustainable management considers the effects of business activity under consideration of the triple bottom line. It focuses on the long-term process of simultaneously optimizing economic, environmental and social goals to ensure the enduring activity of business practices. For this reason organizations must

advance from unfocused investments to consistent sustainability strategies being aligned with core business activities (Lubin & Esty 2010). There is empirical evidence for a positive relationship between corporate responsibility and companies' performance (Funk 2003; Hart & Milstein 2003; Klassen & McLaughlin 1996). The key objective of strategic management research is to identify how competitive advantage can be created and sustained (Teece et al. 1997). Strategies determine the companies' market position and identify necessary key resources required to assure long-term competitiveness. Porter (1996) emphasizes that strategy is always a question of choice, coming along with trade-off decisions. Different complementary approaches which identify the sources of competitive advantage have evolved during the last decades (Orsato 2009).

Porter (1996) competitive positioning approach focuses on the company's external context and indicates that business success depends on the attractiveness of the industry and the companies' relative position in that industry. To achieve competitive advantage, a company must pursue a clear and focused strategy (Porter 1980). Porter proposes three distinct generic positioning strategies (Porter 1980): the low-cost strategy, which aims at low prices and high sales volumes, the differentiation strategy which targets unique products and premium pricing, and the focus strategy which seeks for small but profitable market segments. The lack of attention and due care of the structure and internal competencies of the companies in to the scope of Porter's strategic positioning approach resulted in the development of the Resource-Based View (RBV), which can be seen as the dominant approach of strategic management today (Eisenhardt & Martin 2000). The RBV, analyses the significance of companies' specific resources and capabilities for the creation of competitive advantage. Resources and capabilities should be the basis for the formulation of corporate strategy because they are the sources of competitive advantage and shapes the companies permanent identity. Porter's strategic positioning approach is directed towards the external competitive environment whereas the RBV elucidates internal firm-specific sources of competitive advantage. The consolidation of these complementary strategic approaches is appropriate and applied by numerous IS researchers.

In an organization both economic and environmental value can be created in the internal domain by enhancing the efficiency of processes and material utilization, both resulting in cost savings and emission reductions. In the external domain, sustainability can constitute a unique value proposition the customers are willing to pay for. The innovations that related to sustainability can create new markets and enable differentiation while the improvement of companies' reputation can increase the demand for products and services. Olson (2008) states that a "green strategy has the potential to significantly impact both top line revenue growth and bottom line cost savings." He also emphasized that the crucial significance of aligning the sustainability strategy with the business, IT, and technology strategy. The value of potential sustainable business practices depends on the company's specific context. Competitiveness and returns will only increase if the eco-investments are appreciated by internal or external stakeholders (Bieker 2005).

There are four generic, choice-based environmental competitive strategies (Orsato, 2009) which distinguish between the internal and the external domain of value creation and competitive advantage, that refers to the consolidation of the two leading strategic management approaches as explained above. The author underlines that "strategy implies choice, priority, and focus" (Orsato, 2009) and comes along with trade-off decisions. The environmental strategies are subdivided into two dimensions: in the

"competitive advantage" dimension, companies can either pursue a low-cost strategy by reducing their operational costs through environmental initiatives, or they can strive for competitive differentiation based on a superior, sustainability-related value proposition.

The "competitive focus" dimension determines whether the environmental investments are targeted at internal organizational processes or at market-oriented products and services. On the basis of this classification, four different environmental strategies are defined, as illustrated in Table 2.2.

Table 2.2: Generic competitive environmental strategies (Orsato 2009).

Competitive advantage	Competitive focus	
	Organizational processes	Products and services
Low-cost	Eco-efficiency	Environmental cost leadership
Differentiation	Beyond compliance leadership	Eco-branding

The *eco-efficiency* strategy targets minimization of waste, by-products and emissions. In this way, the production efficiency can be enhanced and costs can be reduced.

The *beyond compliance leadership* strategy concentrates on organizational processes as well, but the competitive advantage is rooted in differentiation rather than in cost reductions. Companies pursuing this strategy even approve unprofitable environmental initiatives to reduce their environmental footprint.

The *eco-branding* strategy refers to a competitive focus on products and services. This strategy strives for competitive differentiation based on environmental product characteristics. The customer must be willing to pay for this environmental differentiation. Thus, reputation and credibility are important intangible assets associated with this strategy.

The *environmental cost leadership* strategy can be a suitable approach for highly price-sensitive markets. This strategy targets radical product innovations instead of incremental process enhancements. Substitution of decisive input materials or new business practices can significantly change markets and competitive conditions.

2.4 Strategic IT/Business alignment

Strategic IT/business alignment is a major concern of business executives and the number one topic of CIOs (Luftman 2004). Many organizations/companies are not able to leverage the full potential of their IT due to a lack of alignment between the IT and their business goals. Companies that have a high degree of alignment achieve to apply IT for strategic purposes, to position themselves strategically in the market, and to leverage their core competencies with the help of the latest technologies (Ravichandran & Lengworsatien 2005). Strategic IT/business alignment can result in superior strategies due to the fact that

the "alignment process and its outcomes constitute a unique companies asset capable of producing IT-based competitive advantage" (Kearns & Lederer 2003).

"Companies cannot be competitive if their business and information technology strategies are not aligned." (Avison et al. 2004, p. 223-246)

The Strategic Alignment Model (SAM) that is developed by Henderson and Venkatraman (1993) applies the most appropriate applied alignment concept, in academic research and practice (Tarafdar & Qrunfleh 2009). The SAM distinguishes between four domains of alignment: *business strategy, IT strategy, organizational infrastructure and processes, and IT infrastructure and processes*. The four domains of the SAM must be balanced to achieve strategic IT/business alignment. To do so, Henderson & Venkatraman (1993) develop a system of cross-domain relationships, which are denominated alignment perspectives. Within the SAM, four dominant alignment perspectives are explained: *strategy execution, technology transformation, competitive potential, and service level*.

2.5 Difference between Green Information systems (IS) and Green Information Technology (IT)

The IT organizations and companies, often at the forefront of managerial practice, are an active player in supporting sustainable economic development. CIOs have identified Green IT as one of the most invaluable strategic technologies for 2008. I cautiously distinguish between green IS and green IT. There is a key difference (Richard Watson, 2008)

- An information technology (IT) transmits, processes, or stores information.
- An information system (IS) is an integrated and cooperating set of software using information technologies to support individual, group, organizational, or societal goals.

Green IT is mainly focused on energy efficiency and equipment utilization. It addresses issues such as

- Designing energy efficient chips and disk drives
- Replacing personal computers with energy efficient thin clients
- Use of virtualization software to run multiple operating systems on one server.
- Reducing the energy consumption of data centers.
- Using renewable energy sources to power data centers.
- Reducing electronic waste from obsolete computing equipment.
- Promoting telecommuting and remote computer administration to reduce transportation emissions.

Green IS (Richard Watson, 2008), in contrast, refers to the design and implementation of information systems that contribute to sustainable business processes. Green IS, for example, helps an organization to

- Reduce transportation costs with a fleet management system and dynamic routing of vehicles to avoid traffic congestion and minimize energy consumption
- Support team work and meetings when employees are distributed throughout the world, and thus reduce the impact of air travel. IS can help manage working at remote locations, beyond telecommuting to

include systems that support collaboration, group document management, cooperative knowledge management, and so forth.

- Track environmental information (such as toxicity, energy used, water used, etc.) about the creation of products, their components, and the fulfillment of services.
- Monitor a firm's operational emissions and waste products to manage them more effectively.
- Provides information to consumers so they can make green choices more conveniently and effectively.

Green IS has a greater strength than green IT because it tackles a much larger problem. It can make entire systems more sustainable compared to reducing the energy required to operate information technologies. Green IS, and sustainable development, should not be seen as a cost of doing business. Rather, they are opportunities for organizations to improve productivity, reduce costs, and enhance profitability. Poor environmental practices result in many forms of waste. Unused resources, energy inefficiency, noise, heat, and emissions are all waste products that subtract from economic efficiency. Less waste means a more efficient enterprise. Firms that actively pursue green IS to create sustainable business practices are doing the right thing for their community, customers, investors, and future generations.

2.5.1 Why companies go “Green”

There are a number of important causes to Go Green with business (Organizations and companies). The most substantial cause is that, preserving the world’s natural resources is the responsibility of every individual both at work and at home.

Additional reasons for your business to Go Green include: (greenbusinessalliance)

- Setting a positive example for employees which boosts morale and company loyalty
- Gaining a competitive advantage by differentiating yourself as a Green-certify company
- Improving efficiency and potentially lowering operating costs
- Providing a cleaner and healthier work environment

Going Green can be an incremental process. As with many other companies’ efforts, there will be easily achievable action steps and more advanced requirements. It is out of question to say how far along the Green path any companies should travel, but a focused effort can have a meaningful impact. There has never been a more appropriate time to Go Green. Its value is recognized more so than ever before.

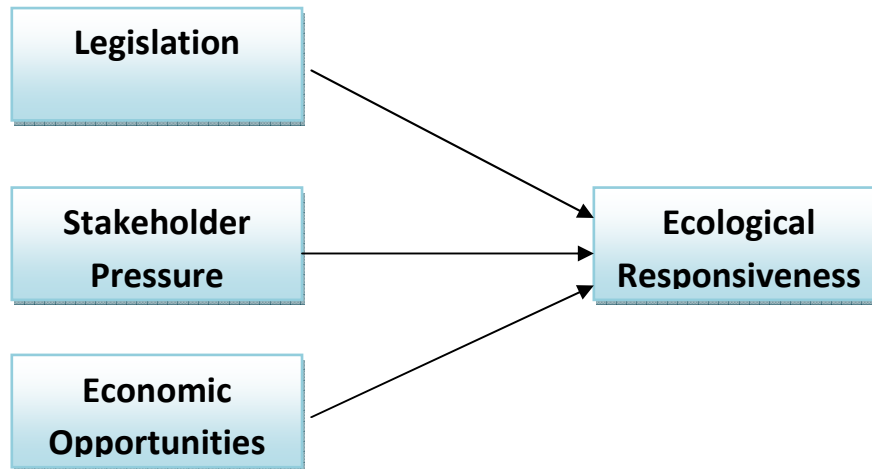


Figure 2.1: Preliminary model why companies “Go Green” (Bansal and Roath, 2000)

A preliminary model, I have used to describe why companies go green is illustrated in figure 2.1. This model has been derived after reading literature reviews. Previous research on the environment and other organizations has pointed out four factors responsible for organizational ecological response such as ethical motives, stakeholder pressures, legislation and economic opportunities (Bansal and Roth, 2000). Legislation has been noted as the most important factor why organizations respond to ecological awareness (Lampe et al., 1991). Organizations comply with legislation due to the increasing factors like legal costs, penalties and fines (Cordano, 1993). Stakeholders such as environmental or social groups, business customers, even local communities have also encouraged many organizations to think about their product impact on the environment (Berry and Rondinelli, 1998). In organizations, IT managers comply with ecological responsiveness usually to avoid the negative comments from environmentalists and also to gain stakeholders support and trust (Cordano, 1993). Another factor for ecological awareness among organizations is economic opportunities. Small companies can lower impacts on the environment by intensifying the production processes, and thus decreasing the input costs and waste (Cordano, 1993).

2.5.2 Project Management for Green IS

The world is going green and it appears that we are starting to get the message as well. We are conjointly realizing that we do not have an unlimited amount of energy or space to continue to utilize resources as we have done in the past. Green Project Management (GPM) is an invaluable part of Green IS. Green Project Management (GPM) is the integration of environmentally conscious concepts with the project management life-cycle. (Greenprojectmanagement.org, 2010). The goal is not to purchase a carbon credit to offset each ream of paper used, but to take the environment into consideration when making key decisions and formalizing processes.

At first glance, it seems like any project team could take steps to recycle and reduce the use of resources. This may include cutting the amount of documentation that is printed and where companies have invested in enterprise project management system, leveraging these systems and any workflow capabilities to receive approval. We also have to consider as project teams, IT managers, IT professionals to think green about each project. The GPM initiative is focused on how to improve the environment using project

management skills coupled with an enhanced sense of awareness of the global landscape along with a goal of incorporating an organizations environmental aspect into project management processes. It is a model where we think green throughout the project and make decisions that take into account the impact on the environment, if any. It is a way to affect “Green think” into every project management process. The point about green project management is not that we are trying to make every decision in favor of the one that is most environmentally friendly. The point is that we have to start taking the environment into account instead of ignoring it. We might make most decisions the same as we do today but there might be some decision we would make differently.

ISO14001:2004³ provides a framework for organizations to act in a manner that enables each to abide by with its environmentally defined standards. It defines a set of elements that contain an Environmental Management System, to help an organization improve its overall environmental performance. The EMS describes an approach for how a company will carry on itself in an environmental friendly and sustainable manner. It is possible that new questions might be asked or new decisions could be made if everyone involved in a project (Project Manager, IT specialist etc) participated in “Greenthink”. Environmentally friendly and sustainable thinking can be enforced to all projects, although we can not expect all projects outcomes to have the same level of environmental performance and gain.

2.5.3 Project Management Process

The project management body of knowledge (PMBOK) is a collection of processes and knowledge areas generally accepted as best practice within the project management discipline. The PMBOK, edited by the project management institute (PMI) recognize nine processes that are involved in project management. How we can relate green thinking to these nine processes is listed below:

- **Integration Management:** Project elements are coordinated including project plan development, plan execution and overall change control. The project integration management ensures that the various modules that form a project are properly maintained so that the goals required from a project are achieved. In project integration management various tradeoffs are made between goals that are competing or conflicting. Integration management also includes project plan development process, project plan execution process and change control. All of these processes require an input and produces an output with the help of management tools. The process where green thinking could be integrated in change control (Tenstep, 2008). In the change control process, all the changes are evaluated and then impacts of the changes are put into consideration. Green thinking can be adopted by project management during the evaluation of the changes and then could be factored in the decision making process.
- **Scope Management:** The scope management process analysis how changes can impact a project or business value. This is a process where environment can also be included so that it also takes into account the impact of the changes on the environment (Tenstep, 2008).

³ Environmental management system-General guidelines on principles, systems and support techniques.

- **Time Management:** This process schedules the project processes from the start till end. A Green initiative can be acquired in this process. In addition, it might be facilitative to include activities according to the company’s environmental policy (Tenstep, 2008).
- **Cost Management:** The specific project could also apply Green thinking in cost management and include costs for processes that are environment related and also other process activities.
- **Quality Management:** Quality management mainly focuses on the stakeholders’ expectations or requirements on the quality of the product. If environmental considerations of the project could be discussed with the stakeholders then some green areas could be interesting to the stakeholders. If stakeholders have some environmental requirements, these requirements could be addressed with other requirements that are already gathered.

A quality control checklist could be used to ensure deliverable quality and some questions regarding environmental aspects of the project could also be included in the checklist (Tenstep, 2008).

- **Human Resource Management:** Project team members could be educated on the basis of green thinking in their work. This will be helpful since project team members are involved in analysis of the project and in providing alternative solutions.
- **Communications Management:** Organizations that are compliant with ISO 14000 standards may have people working on Environment Management Process and these individuals can represent a particular stakeholder group who might be interested with the organization policy. The communication plan should be such that stakeholders are aware of the organization environmental policies.
- **Risk Management:** Risk management involves identifying the risks and their impact on the project. If a company applies green thinking into the risk management phase, the project team may be able to analyze the impact of the risk on environment.

2.6 Sustainability and Green IS

Green IS (Information System) is an integral part of the Information Technology world. Through a constrained set of strategic objectives, Green IS Management aims at delivering incremental benefits to the organization by both seeking alternatives to costly processes, and optimizing the overall IT landscape in its energy envelope (power consumption, heat generation, air-conditioning requirements).

Beyond the actions of individuals, there are many ways that Green IS can contribute through corporate, governmental and other institutional efforts. Green IS innovations can extend the scale with which human institution support the movement toward global sustainability. One of the primary institutional contributions of Green IS is through improved infrastructures. Smart energy grids enable more efficient power utilization. Improved transportation systems reduce fuel use while optimizing the movement of people, objects and materials around the world. More effective waste management systems can facilitate more comprehensive recycling and relieving of useful materials after their initial usage is complete.

2.6.1 Virtualization and Cloud computing

2010 has been touted by many in the ICT sector as the ‘Year of the Cloud’ (Greenpeace.org, 2010). Cloud computing is spreading like wildfire. The number of organizations and companies that are moving their IT operation to the cloud is tremendously growing. Cloud computing continues to gain more mainstream adoption as more companies move into the cloud. Large organizations rely on Cloud computing for testing and developing new applications, and for hosting applications that are less-critical, while small businesses use it for mission-critical applications. In 2008, The Climate Group and the Global e-Sustainability Initiative (GeSI) issued SMART 2020: enabling the low carbon economy in the information age.⁴ The study highlighted the significant and rapidly growing footprint of the ICT industry and predicted that because of the rapid economic expansion in places like India and China, among other causes, demand for ICT services will quadruple by 2020.

Cloud computing is not a technology but an approach to computing. Organization and small businesses can use cloud computing either as a consumer or a provider. As a consumer, organization can take advantage of cloud services from the private/hybrid cloud infrastructure from their organization, or from external service providers. Cloud services generally include some form of Infrastructure-as-a-Service, Platform-as-a-Service, or Application-as-a-Service. As a provider for internal cloud services for an organization, they can use cloud computing to create IT and business agility, and increase resource efficiency. The business community has begun to embrace cloud computing as a viable option to reduce costs and to improve IT and business agility.

“Virtualization” is an emerging IT paradigm that separates computing functions and technology implementations from physical hardware. It enables organizations; reduce costs by increasing energy efficiency and requiring less hardware with server consolidation.

2.6.2 E-waste in the 21st century

Today’s trash becoming tomorrow’s problem, E-trash is a growing concern in this world. According to the Environmental Protection Agency, in 2005 USA threw out 2.2 million tons of unwanted electronics. Most of it went into landfills. Only about 345,000 tons were recycled. A simple definition of *E-waste* “Loosely discarded, surplus, obsolete, or broken electrical or electronic devices.” describes by Waste electrical and electronic equipment(WEEE) an environment agency of U.K

Although environmentalists say that global warming is one of the big threats for environment, but electronic waste, or "e-waste," is the most threatening environmental problem in the world today. Though the exact amount is unknown, the United Nations estimates that roughly 20 to 50 million tons of e-waste are generated worldwide each year. So, it is very much important for every business organizations/industries how they handle the E-waste (Electronic waste) management system. In addition, E-waste could be the invaluable factor for every organization who wants to adopt Green IT policies in the management level.

⁴ Climate Group and the Global e-Sustainability Initiative (GeSI)(2008). SMART 2020: enabling the low carbon economy in the information age.

2.7 Opportunities for Green IS and Green IT

There are three types of sustainability goals (Hart, 1997) such as the first goal is to prevent pollution by minimizing the level of emissions, effluents, and wastes. The second and higher level goal is product stewardship, where one focuses on both reducing pollution and also minimizing the adverse environmental effects associated with the full life cycle of a product, where the end state of a product is involved in the beginning of another. The third and utmost goal is the use of clean technology that creates no harmful emissions or waste. The three goals, I would apply at three different levels: Private companies, organizational, and societal. The combination framework (Table 2.3) can be used to identify opportunities to deploy IS or IT to improve sustainability. Each of the cells will be discussed later.

Table 2.3: Green IS and IT opportunities

	Private Companies	Organization	Societal
Pollution Prevention	- Flexible printing capabilities - automated energy conservation system	-Thin client -Virtualization -Telecommuting	- Electronic exchange of information - Congestion systems
Product Stewardship	- Recycling	- reuse components - recycle computers	- Governmental policies - Societal norms
Clean Technology	-Paperless interaction	- video conferencing - collaboration tools	-Open source -Smart homes and appliances -e-commerce vs. traditional commerce

2.7.1 The framework for Green IS

The frameworks I have used to identify Green IS opportunities by sustainability options (pollution prevention, product stewardship, and clean technology) in terms of action levels (Private companies, organization, and societal).

- Pollution prevention (Private Companies):** There are many actions that private companies can take to reduce the IT impact on pollution. For example, office desktop computers can be turned off when they are not being used. Office employee could print on both sides of a sheet of paper (i.e., duplex) or turn on the energy conservation preferences for computer operating system so that computer will go to sleep after a certain period of inactivity. It is estimated that applying energy settings, such as ‘sleep when inactive’, can reduce greenhouse gas emissions at a rate

equal to taking more than 8,000 passenger cars off the road for an entire year, or conserving 16 million liters of gasoline.⁵

- **Product stewardship (Private Companies):** In addition to using energy more efficiently, private companies can play a significant role in product stewardship, such as in recycling used electronic products. For example, office computers can be reused by upgrading configuration rather than sending them to trash. When companies decide to dispose of an electronic product, they should check its manufacturer’s web site for recycling options and procedures.
- **Adoption of cleaner technology (Private Companies):** For private companies, paying bills online is a relatively easy change with a positive impact on the environment. It is faster and more convenient. UNESCO reports that of the average 1,510 sheets of paper produced per person in the world per year, at least half of these sheets go through printers and copiers to produce office documents. A single tree produces about 80,500 sheets of paper⁶. Electronic media can be more environmentally friendly than paper. Acquiring news, music, movies, and books in electronic format is now possible because of the technological infrastructure and information systems in place. E-books can reduce paper consumption.
- **Pollution prevention (Organizational):** Organizations can redesign their IT infrastructure to make it more energy efficient. A thin client, a lean PC that relies on a central server for disk storage and applications processing, uses less energy than a regular PC. Germany’s Fraunhofer⁷ Institute reports that, when comparing thin clients to personal computers, energy consumption is at least twice as low, even when factoring in the additional energy and cooling power required by the server associated with the thin clients. In addition to the reduction of emissions, e-waste is also reduced by switching to thin clients. A thin client contains significantly fewer components and has a longer life expectancy than a regular PC. Virtualization, software running on a virtual foundation rather than the physical hardware, has become a popular energy saver. Server virtualization (the most common form of virtualization) makes the physical resource (i.e., the server) function as multiple logical resources (e.g., running multiple operating systems). Virtualization means doing more work with fewer resources, which in turn free up data center space and lowers energy bills.
- **Product stewardship (Organizational):** Organizations should develop extensive recycling systems and change their behavior to think of recycling as the first step when they dispose electronic items. In many cases, electronic goods are not recycled because organizations have not created the procedures and information systems to facilitate recycling. Most organizations have complicated information systems for manufacturing, distribution, and sales to get their products into the homes of consumer, but few go for the complete recycle process. A few organizations have created such full cycle systems. Dell, for an example, allows its customers to recycle their old printers (if they buy a new one) by simply providing the new printer’s service tag and scheduling a pick-up; customers accomplish both activities online via Dell’s web site. Dell has

⁵ <http://www.techworld.com/green-it/features/index.cfm?featureid=3496>

⁶ <http://www2.sims.berkeley.edu/research/projects/how-much-info-2003/print.htm>

⁷ <http://www.fraunhofer.de/en/.html>

produced a simple and convenient process, assisted with an IS to track the movement of the products to be recycled. It can also gain by recycling some of the returned products, or parts of them, where this is possible.

- **Adoption of cleaner technology (Organizational):** For organization face-to-face meetings, can consume considerable energy when the attendees are scattered across the globe. Video conferencing is an alternative, particularly with today’s high quality systems. Video conferencing can transcend distance to replicate face-to-face communication. In the era of globalization and global climate change, organizations need to substitute cleaner technologies, such as video conferencing and electronic collaboration tools, to bridge the distance when a meeting’s participants or a work team are scattered across different cities, countries, and continents. Electronic distributed meetings support communication without the carbon footprint of travel. Organizations can also used cleaner technology (e.g., solar or hydro power) to run their data centers. Data center energy consumption is one of the most important green technological concerns because power and cooling account for up to 40 percent of a data center’s costs⁸.
- **Pollution prevention (Societal):** Countries and regions can dilute pollution by encouraging a shift to technologies that produce less emission. In the instance of IS, the energy cost of exchanging data can be significantly reduced by moving from the postal system to electronic networks. Electronic Data Interchange (EDI), for example, supports the majority of electronic commerce transactions. Depending on which standard is in use such as ANSI ASC X12 etc, structured information can be interchanged between and within organizations, governments, and other groups. In the same way, XML supports the electronic exchange of information through an open standard. Both of these technologies can dilute the use and manipulation of physical administrative documents such as invoices, sales orders, etc. and thus minimize pollution.
- **Product stewardship (Societal):** Governments can play an active role in promoting, and where necessary forcing, organizations to become better product stewards. Enacting law is being used to make recycling of electronic products mandatory. Government, for instance, can introduce an Electronic Waste Recycling Fee. In 2003, the European Union enacted the Waste Electrical and Electronic Equipment Directive (WEEE Directive), which has become European Law, setting collection, recycling, and recovery targets for all types of electrical goods.
- **Adoption of cleaner technology (Societal):** An information society that consumes and exchanges information electronically such as emailing rather than posting a letter is cleaner than a society in which information exchange is based on paper and the postal system. An information society can also organize for the production and distribution of electronic goods to be cleaner. The open source model is a very good example of a cleaner form of production and distribution. Software is developed without requiring the physical presence of workers in the same physical space, that is, an office building and its significant infrastructure and the environmental costs of daily commutes. Furthermore, once developed, open source software can freely flow across borders at electronic speed, without the need for wasteful packaging and retail store shelf space. The footprint associated with both production and distribution can be much lower for information

⁸ <http://www.ciainsight.com/c/a/Trends/The-Greening-of-the-CIO/1/>

products. Finally, the information age needs to find many other ways in which it can deploy IS to minimize society’s ecological footprint. A generation of innovation could create a sustainable society, and much of this innovation will involve IT and IS in a variety of ways.

2.8 Summary

As revealed by the literature survey, Green IS practices can indeed have the capability to leverage companies’ competitiveness. By implementing consistent Green IS initiatives such as sustainability and corporate strategy (See table 2.2) and framework for green IS (See table 2.3), competitive advantage can be created and thus Green IS should be understood as an integral part of IT strategy. I defined the definition and drivers of Green IS (See table 2.1) and based on that companies can take environmental initiatives support low-cost strategies or facilitate competitive differentiation. In consequence, the interrelation of business strategy, sustainability goals and IT constitutes a complex challenge. Even so, joining and adjusting these strategic domains promises great opportunities for environmental protection and economic progress. Finally, Green IS initiatives are considered recently as a means to reduce costs and risks whereas technology-based overall strategies aimed at the creation of competitive advantage and sustainable, profitable growth can hardly be found.

3. RESEARCH METHODOLOGY

3.1 Research Strategy

In this research, I enforced a collection of research methods to fulfill the main purpose of this study. The acquired methodologies include literature review, multiple-experience studies through qualitative interviews, cross-sectored case study analysis of the demonstrated strategic green IS alignment framework and generalization. Quantitative and qualitative research approaches are the two main research approaches for carrying out research. I have conducted a qualitative research which is based on interviews. According to Myers and Newman(2007) the qualitative interview is a powerful research tool which is an excellent method of collecting data that has been used profoundly in IS research. In a qualitative research, there are different types of methods to collect data such as Interviews, observations, and review of documents etc. The most common types of interviews are structured interviews, semi-structured interviews, un-structured interviews, focus group interviews (Creswell, 2007; Myers & Newman, 2007). The five philosophical assumptions lead to an individuals choice of qualitative research such as ontology, epistemology, axiology, rhetorical and methodological assumptions (Creswell, 2007). Although the paradigms of research continually evolve, qualitative research represent post positivism, constructivism, advocacy/participatory, and pragmatism (Creswell, 2007). In the choice of qualitative research, investigations make certain assumptions. These philosophies consist of a stance towards the nature of reality (ontology), where researcher knows how she or he experiences, the role of values in the research, the language of research and the methods used in the process (Creswell, 2007).

All research should include an explicit and systematic approach to finding out things according to the research question. In this research, to analyze the use of Green IS along with studying how IT and IS respond to the management by “Green thinking” in private organizations and companies, several sources of data must be used and a dynamic combination of some relevant philosophical assumptions is needed to carry out different practices throughout the research. There is a demand to adopt participants’ quotes and themes to support the research through providing evidence from multiple perspectives (Creswell, 2007). This requires researchers to integrate themselves into the field of study by collaborating with participants and being part of their lives. Also, researchers aim to create values of their studies and therefore are likely to report their values through their unbiased interpretation of data collected from participants in the field (Creswell, 2007). Usually, researchers tend to use a literal and personal language in their narratives with emphasis on defining and describing study terms and definitions from a participant perspective rather than having a predefined list of terms and definitions. The procedures used to collect and analyze data from the field are inductive and emerging; in the sense that research should be flexible in responding to events during the research process which sometimes require changing the plan of the research (Creswell, 2007). In this study, it is important to recognize these philosophical assumptions to create an attitude toward different practices associated within the study in the sense of bringing up philosophy into practice.

3.2 Research Approach

The next stage of qualitative research is to decide upon a framework or an approach of research inquiry (Creswell, 2007). There are several research strategies that are different in their characteristics of inquiring and analyzing empirical evidence (Yin, 2003; Creswell, 2007). Therefore, the selection of an appropriate research strategy that is useful for carrying out the research is a critical decision and requires considerable attention. Three different conditions discussed by Yin (2003) that help social researcher determine what and when to use a particular research strategy. The three conditions are the types of research questions, the ability of the researcher to control events and access available resources and the degree of focus on contemporary as opposed to historical events. Since the research question involves “Why and how do organizations implement Green IS measures” which refers to the term how small business organization and companies think environmentally, ‘How’ Green IS can optimally support competitive environmental strategies in private organization”.

As Yin (2003) mentioned in his book that “How” and “Why” questions are better analyzed with case studies. A case study is one of several ways of doing research whether it is related to science or social. It is a research strategy that could be used in qualitative analysis to interpret problems around us which researches our surroundings and people. For case studies, these five factors are important (Yin, 2003):

- Study Question: what kind of questions should be asked must be clarified earlier. In some cases “How” and “When” could be enough while in some “Why” and “What” could be enough.
- Study propositions: If the proposition of a case study is known, then the researcher can move to the right direction with the analysis.
- Unit of analysis: This part tries to define what the case of that investigation is, which should be analyzed. A case could be an individual, a committee, an organization, several individuals working together etc.
- Linking data to propositions and criteria for interpreting the findings: The findings one gets from the analysis or findings from previous studies of the case must be linked to different techniques to complete the investigation.
- Criteria for interpreting a study’s findings: Different statistical interpretations of data could be used. Rival explanations must be found out so that information can be recorded about them in the data collection stage.

The primary strength of engaging the qualitative research in this study is to span the topic of using Green IS and IT into the management level and come up in direct contact with small business organizations and private companies through interviews. In this context, the use of Green IS and IT in global companies as well as on the role of IS in business sustainability, the qualitative research permits me to inquire into topics and subjects in an elaborate view to get a deeper understanding of this phenomenon. In addition, it is important to explore the activities and roles of organizations and companies in regards to sustainability and to get a better understanding of the use of Green IS and IT.

3.3 Data Collection and Techniques

Collecting data is often an iterative process using different sources of evidence. For doing a high quality collection of data, preparation is necessary. Preparing for data collection can be difficult and complex, and if not done properly it can jeopardize the entire master thesis. For research there are several factors which affect the data collection strategy or method. There are several methods of gathering evidences used in qualitative research (Yin, 2003). These methods include interviews, observations, interpretation of documents and artifacts (Creswell, 2007). During data collection, I have used techniques such as note taking and some cases audio recording. In the end, my research study has involved methods such as face to face interviews, telephone interviews and e-mails.

3.3.1 Interview Guide

I have carried out semi-structured interviews containing a number of questions based on the topic Green IS possibilities in private companies. Semi-structured interviews are interviews with predetermined questions but the discussion is open and not limited to them because these interviews focus on valuable meanings of interviewees (Kvale, 2009). Open-ended questions provided opportunities to discuss some questions in more details, as a consequence having the freedom to probe the respondent to elaborate on original responses. An interview guide derived from the literature review was prepared before and followed as much as possible in the interaction with the selected companies to receive comparable results. I have established selection of the key informants based on their knowledge of Green IS initiatives of their companies and the underlying reasons behind them. Thus, I identified IT managers and CEO of companies as the primary key informants. In some cases, a company did not have an IT manager. In that case, I interviewed multiple senior managers. I have perceived no systematic bias in the context descriptions, motivational dimensions, or companies initiatives, for reassurance, I have also gathered secondary data for each company to assess the reliability of the key informants.

The questions that were formulated for interview guide(See table 3.2) are based on the research questions which concentrated on implementation of Green IS measures in private companies. To make further obvious structure for the research questions, I have divided them into Green IS measure and perspective(See table 3.1 and 3.2). The questions were asked to CEO and IT managers for selective companies.

Table 3.1: Interview questions based on IS measure related to research questions

Green IS measure	Interview Questions
<ul style="list-style-type: none"> - Competitive advantage - Competitive Environmental strategy - Competitive focus - Economic Opportunities - Ethical motives - Objective of sustainability management - Objective of IT management - Performance criteria - Pollution Prevention - Product Stewardship 	<ol style="list-style-type: none"> 1. Would your company consider switching to green data centers without a regulatory push? 2. When buying computers and peripherals does your company consider in terms of the product lifecycle, and recycling issues upfront? 3. How does your company care about sustainable IT management and use? 4. In what ways is your company showing concern in regards to sustainable IT disposal? 5. Do you really think that video conferencing is a viable green alternative for long distance communication? 6. Is your company aware of the benefits of Cloud Computing for a new data center? 7. How do you ensure recycling IT equipments for your company? 8. What affordable steps can Company/Organization take to green their data centers? 9. How does your company reduce electricity consumption on the desktop PCs? 10. Can you discuss the disadvantages of cloud computing in the new Organization/companies?

Table 3.2: Interview questions based on IS perspective

Research Questions	Perspectives	Interview Questions
<ul style="list-style-type: none"> • Why and how do organizations implement Green IS measures? • How can Green IS optimally support competitive environmental strategies in private organization? 	<ul style="list-style-type: none"> • Green IS for efficiency • Green IS for transformation • Green IS for innovation • Green IS for responsibility 	<ol style="list-style-type: none"> 11. Is Green IS part of the IT strategy? 12. Does your company consider sustainability goals that reflect Green IS strategy? 13. What are the outcomes of Green IS investments? 14. How can IT management take responsibility on the impact of the environment? 15. What is the objective of IT management in regards to transformation?

3.3.2 Conducting Interviews

In total, I have conducted two interviews and the time duration was one to two hours. Before each interview, the purpose of the thesis, as well as the interview questions have been sent to the interviewees so that they could be prepared for the interviews. The interviewees explained their experiences about Green IS and Green IT, answered a set of questions that are addressed in the interview guide. I took detailed notes during the interviews that were not recorded. The interviews that were not recorded did not lead to a systematic selection bias because they were distributed randomly across the data sets. All interviews were conducted in English. These interviews gave new knowledge derived from participant “invaluable experiences”. Each interview has been transcribed into a written text for the later analysis (Kvale, 2009).

3.4 Data Analysis

Data analysis is the process of ordering and organizing data so that important information can be easily extracted. After transcribing each interview, the value of the information has been understandable. The data processing techniques I have used were pattern matching, counting, and minor calculations. The analysis of the interviews based on ad hoc meaning technique which starts by forming the interview texts and then condensing the meanings into forms that help to come up with the right conclusions. The meaning condensation data makes it easier for me to clarify the necessary parts that are related to the topic and the purpose of the research study and reduce redundant or unnecessary data (Kvale, 2009). Transcribing, the procedure for producing a written version of an interview or conversation is often time consuming and produces a lot of written text. Also, categorization has been employed in this study to reduce structured and long transcribed text into tables and be able to compare the different interviews. The answers of interviewees under one category should be seen so that I could check the similarities and differences between them. Then, interpretations have been provided in the light of literature for checking whether the interviewee's answers were the same as the literature or a new or different information emerged (Kvale, 2009).

3.5 Conceiving Research Model through Strategic Green IS Alignment Framework

As described in literature review in chapter 2, aligned Green IS strategies are essential because they can contribute to the achievement of sustainability targets of organizations. Companies' competitiveness can be improved through environmental commitment that differentiates from competitors and enhanced efficiency that comes along with higher productivity. Acquiring strategic advantages with Green IS's full potential; a company requires a clear strategic orientation and consistency of its sustainability and Green IS strategy. The multiple-case study based on Literature review (Chapter 2) indicates that executives need a sound rationale that conducts their sustainability initiatives for setting priorities in line with the company's core business. Non-aligned environmental activities do neither lead to increased competitiveness nor to the optimal reduction of the Companies' environmental footprint. The development of aligned Green IS strategies requires the appreciation of the impact that IT and corporate sustainability can have on companies' competitiveness. As indicated in chapter 4, referring to the analysis and discussion of my case study analysis, a framework for the alignment of business, sustainability and IS strategies is strongly needed.

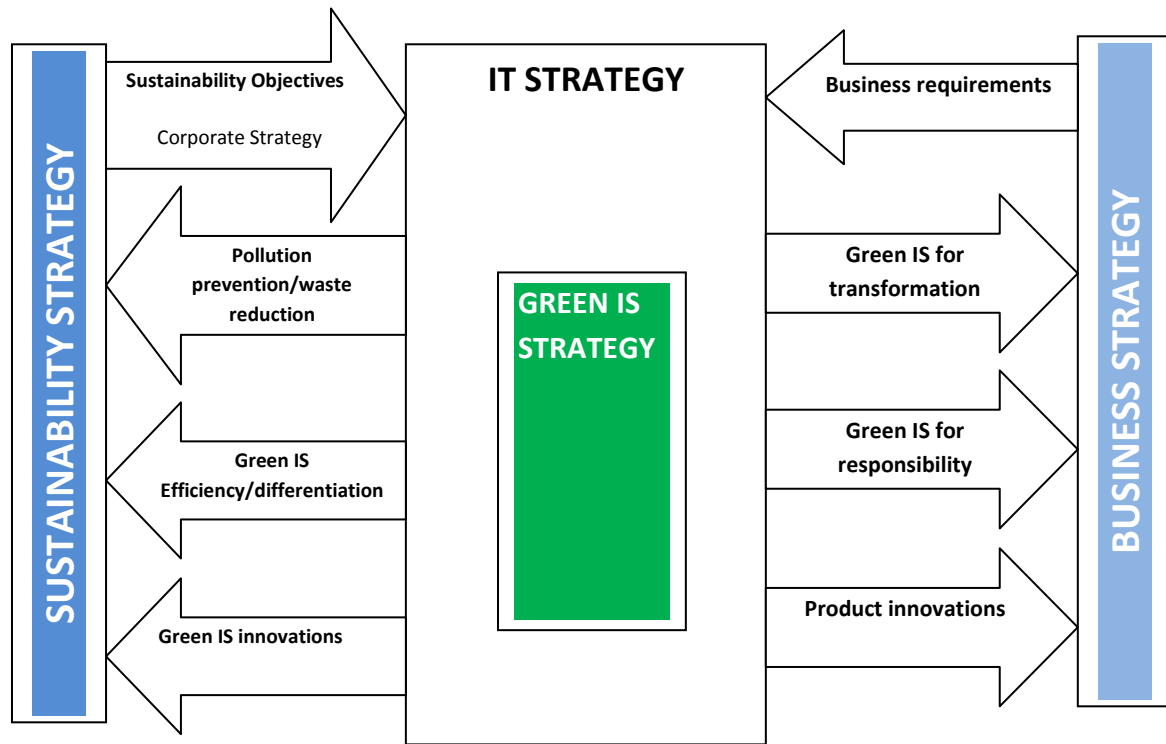


Figure 3.1: Conceiving Research Model

To conceive such a framework, I have integrated the concept of Green IS into the theoretical concept of IT strategy. This integration eases the linkage of Green IS practices to the strategic context of the companies. As displayed in figure 1, the IT has a strategic impact on the internal organization in terms of supporting and designing business processes, on competitive advantage through efficiency/differentiation, and on the product portfolio (technological innovations) of the companies (Bakos & Treacy 1986; Earl 1989). Here I indicate that the IT has an impact on the environmental footprint of the organization as well and according to this, the Green IS strategy should be an integral part of the IT strategy. As a consequence, the IT strategy is linked to the business strategy and the sustainability strategy of the companies. Hence the Green IS strategy should be aligned with the corporate sustainability goals to support environmentalism optimally. This can be achieved on the basis of decreasing emissions and waste in two areas: in the scope of the IT organization (purchase, operation, and recycling of IT systems); on the other hand throughout the whole organization (reengineering of production and business processes). The Green IS measures can either focus on efficiency enhancement, which comes along with decreasing operational costs, or they can aim at ecological differentiation, which distinguishes from competition and creates additional value. By developing innovative environmental technologies, the company can differentiate from competitors as well (Harmon et al. 2010).

3.6 Research Validity and Reliability

The validity and reliability of research design is another important aspect of research which must be considered. Quality is related to credibility, trustworthiness, confirmation ability and data dependability. There are four conditions which are related to design quality in a case study, including construct validity, internal validity, external validity, and reliability (Yin, 2003). In the construct validity, I have analyzed the results of the Green IS measure based on the Generic competitive environmental strategies (Orsato 2009). In this case, the internal validity is based on each study. Furthermore in external validity, I demonstrated the IS possibilities to which a study's findings can be generalized. Finally, I have validated the entire analysis by checking with the interviewees. In this thesis, I used multiple-case design because I used two companies as my different cases so that I could compare the Green IS measure in two companies. The reliability verification is used to measure how consistent the operations of one study were with the same results (Yin, 2003).

3.7 Research Ethics

Researchers have been arguing about many ethical considerations regarding ethical behavior, they all accept that ethical issues are important (Israel and Hay, 2006). Ethic is a generic term for various ways of understanding and examining the moral life (Seale, 2007). Ethical behavior can help to protect individuals, community and environment. Ethics are also used to ensure the researcher's integrity, honesty and whether strong moral principles are followed. It is very important to obey the ethical rules when conducting a research. In this research, I have considered all three main categories of ethics such as meta-ethics, normative ethics and applied ethics (Israel and Hay, 2006). Meta-ethics is concerned with analysis of moral concepts, exploring the meaning, function, nature and justification of normative judgments, and how ethical evaluations are made. Normative ethics guide the researchers what one should or should not do, in specific situations. It provides the frameworks which allow me to judge people's actions as right or wrong, good or bad. Applied ethics involves how normative ethical theory can be enforced in particular issues or situations. The reason for applying all three types has been the fact that I have interacted not only with some employees but also with the companies and the environment surrounding them when investigating the research area. Considering the ethical situation in this study, I had to consider issues such as informed consent, confidentiality and the potential consequences of involvement in this research. “Informed consent” includes the purpose, methods, risks, inconveniences, discomforts and possible outcomes of the research. Then the participants of this research study had to agree to take part in this research after being fully informed. It's very important to inform the interviewees of the later use and publication of the interview they are taking part in (Kvale, 2008). I have addressed this important ethical issue by letting our interviewees know about the purpose of study. Contracts can also be used as agreements between the researchers and the participants. I have made an agreement with the company that is called NDA (Non-disclosure agreement). I also discussed the confidentiality issues with the companies because there could be some confidential data which were not supposed to be published. Finally, I have sent a copy of the final interpretation of each interview to its participants before their publication to ask for their opinions and also to check and correct any misinterpretation or bias.

4. EMPIRICAL FINDINGS

In this chapter, I present the findings obtained from specific interviews in combination with the analysis of them. This section represents the empirical analysis as the result of conducted interviews in two different companies including a large Organization in Bangladesh. The analysis and discussion for each company is included in detail as well. The companies and their representatives in the interviews are introduced briefly in order to motivate their suitability for this research.

4.1 Company A Overview

Company A is a Software company based in the Dhaka, Bangladesh, with its branches in Chittagong (Port-city). They employ highly qualified software development engineers and IT specialists in several countries. Over 5 years of work, they have developed a range of solutions and gained ample experience in the services they offer: Custom Software Development, E-commerce Solutions Development, Web development, Consulting, Interior design and Real estate. According to the interviewee (CEO) from this company, Company A has started its Green IT experience in 2006 by adopting a new company policies with own protocols and then carried on with the experience by redefining their infrastructure.

4.1.2 Green IS inception for this company

Green IS emphasizes the role of methods and practices that reduce a company's environmental impact. By adopting Green IS competitive environmental strategies, Company A can optimize their services, better manage risk, and resolve resource constraints-all while reducing overall energy costs by 10%-30%. Green IS advantages will enable and empower this organization to meet all the Global warming related challenges and at the same time help company to contribute back so even the organization can participate and contribute to environmental corporate responsibility.

The interviewee stated that the organization has implemented "Green" data centers that was started in the year 2008 and finalized by 2009. Company A itself very much interested about analyzing how Green IS can support their current physical system. To be more specific, they would like to apply a framework to identify opportunities for Green IS. For Green IS inception I have identified the below factors.

- **Competitiveness:** I delineate the term "competitiveness" here as the potential for Green IS reactivity for improving long-term profitability to the company. According to company IT/Business Analysts of Company A, Green IS responses that improved competitiveness included energy and waste management, source reductions resulting in a higher output for the same inputs (process intensification), green marketing, and the development of "eco-friendly products". In terms of prominent characteristics, interviewees from this organization motivated by competitiveness expected that Green IS affected by "Green thinking" and proper using of Green IS that led to sustained advantage and hence improved their long-term profitability. According to interviewee:

"All well-known organizations compete on price and quality and are now competing more on the environmental issues, as well. Finally, the competitive advantage can be gained through environmental responsibility." (CEO, Company A, Appendix A)

Competitiveness, in contrast to other motivations, resulted in higher tending paid to the cost-benefit analysis of Green IS planning for this company. For an example, the following persuasion was expressed by CEO and echoed by Business analyst as well:

"Once you have investment the money, then maybe the benefit versus the payment costs may be of economic value over the long term." (CEO, Company A, Appendix A)

They were often focused on the "numbers" of ecological responsiveness, showing concerns epitomized by phrases like "costs," "advance technology," such as cloud computing, video conferencing and advanced data centers. Here the interviewee stated that advanced data centers provide a more flexible way to meet unpredictable changes in business and IT demand. Additionally, we have seen the cloud computing improve operating and capital costs to IT environments and enhance responsiveness to our clients around the world. There are many different things that Company A can do. The first one is the consolidation of multiple data centers into a few or, better yet, one. Because the fewer facilities they have the greater their opportunity is to maximize efficiencies in a single facility or in fewer facilities. Finally, he stated that people don't tend to talk about a lot is that every company often has a main data centre and then they have disaster recovery sites, which are not utilized very often. One of the great ways to save power and facility space is to consider co-location for those disaster recovery sites.

- **Management Issues:** Green IS issues are now essential for corporate activities. However, with the rapid spread of Green IS concern, an increased burden has been placed on the environment, with more power being consumed, among other challenges. In terms of management issue, I have considered this organization into two approaches

Green of ICT- in organization: "Green of ICT" focuses on the actual operation of ICT equipment and information systems. It intends to reduce the burden on the environment through power savings in ICT equipment of this particular organization and the recycling of resources. For an example, Green Housing, Data center. The interviewee stated that *"we must concentrate on Green house office environment to ensure the green IS adaption but right now we r only taking care of reducing environmental burden through data center"*. Data center that enables several dispersed facilities to be consolidated, thereby reducing power consumption while improving efficiency in all aspects including cost, operation and maintenance management.

Green by ICT- in organization: "Green by ICT" focuses on the efficiency improvements brought about by the active use of ICT. It aims to reduce logistics and human movement through the sharing of information utilizing ICT in this organization. The interviewee highlighted the importance of "Communication Tool". He also mentioned, *"it improves business efficiency and reduces the burden on the environment"* through "Communication

Tool" for easily enabling IP telephone based teleconferencing and web conferencing on PCs and Remote Tool.

From these two perspectives, Company A, in "Green ICT" reduces the burden on the environment while at the same time leading to cost reductions and improved operational efficiency.

- **Legitimation:** Green IS consultancy can help organizations to understand and comply with climate change regulations and at the same time, give a clear, manageable Green IS action plan that shows how improvements will bring a real and demonstrable return on investment.

"A motive of legitimation refers to the desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values, or beliefs" (Suchman, 1995 pp 571-610).

In the interviewee's opinion, Sustainable IT management and use has to do with the way a company manages its IT assets. It includes purchasing energy-efficient desktops, notebooks, servers and other IT equipment, as well as managing the power consumption of that equipment. It also refers to the environmentally safe disposal of that equipment, through recycling or donation at the end of its lifecycle. This company can be adopted compulsory Green policies through better IS practices which will have a huge effect on emissions and help companies not only to meet targets under the Environment issues and avoid penalties but also to save money.

- **Corporate Social Responsibility and Business Success:** Green IS management is an integral part of Information technology world. By a constrained set of strategic targets, Green IS Management intends at delivering incremental benefits to the organization by both seeking alternatives to costly processes, and optimizing the overall IT landscape in its energy envelope (power consumption, heat generation, air-conditioning requirements). Company responsibilities are often divided into economic, social, and environmental categories similar to the categories proposed in the popular concept of sustainable development (Peattie, 2001). Corporate Social Responsibility (CSR), it refers to business decision making linked to ethical values, compliance with legal requirements, and respect for people, communities and the environment. The World Business Council for Sustainable Development (WBCSD) defines CSR as *"The commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve quality of life"*. But the interviewees think that, besides corporate social responsibility, some other factors should be judged as well such as recycling IT equipments and sustainable IT disposal. The two interviewees' opinions are listed as following: Interviewee A said:

"Sustainable IT disposal refers to the safe disposal of IT assets. It ensures that old computer equipment does not end up in a landfill, where the toxic substances it contains can leach into groundwater, among other problems. We should consider the time spent in changing policies how we can connect with waste management company as we all know the time spent in realizing of recycling IT assets is an important factor for any organization".

(CEO, Company A, Appendix- A)

Interviewee B thinks “*certain pieces of IT equipment, such as computer monitors, are classed as hazardous waste and cannot legally be disposed of with general waste. Secure IT recycling specializes in the Secure Collection and Disposal of redundant I.T. Equipment. Our organization has not done yet any agreement with “Waste management Company”. But we are very concern about recycling IT equipments”.* (IT Manager, Company A, Appendix- A)

Awareness of CSR issues is increasing worldwide, and ICT efforts in harmony with environmental measures are also gaining attention in every big organization.

4.2 Company B Overview: (IT and Telecommunication)

Based on the Company code of conduct along with interviewee request the name of this company will be kept undisclosed in this research so that it’s referred to as ‘Widely known IT and telecommunication services’ in Dhaka. The company was founded in 1978, and is now renowned as Telecommunication Company. The company has steadfastly remained independent, but not isolated. Across the globe, company B has developed productive alliances and partnerships that advance their capacity to develop innovative IT technology at lower costs. Company has 1000+ employees and well established in terms of IT activities. This large telecommunication company started adopting Green IT strategy in 2002. Therefore studying this company’s Green IS adoption experience could help me learning more about the Green IS that affect in this company.

4.2.1 Green IS inception for this company

In the case of widely known Telecommunication Company, the interviewee mentioned that they are already included Green IS policies in their business strategy but my intention was how I can introduce Green IS competitive environmental strategies into the management system. The interviewee also mentioned that some of the benefits of implementing Green IS measures are as follows:

- Become Energy Efficient
- Save Natural Resources
- Optimize Process
- Enhance Infrastructure
- Reduce dependency on Natural Resources
- Initiate Recycling Initiatives
- Imbibe Environmental Corporate Responsibility Culture
- Realize Branding Goals

Green IS inception is not an island in the Information Technology world; it is an integral part of it. Through a constrained set of strategic objectives, Green IS management aims at delivering incremental benefits to the organization by both seeking alternatives to costly processes, and optimizing the overall IT landscape in its energy envelope (power consumption, heat generation, air-conditioning requirements).

- **Competitiveness:** This telecommunication company offers IT and telecommunication services to the public administration. For their IT services it operates a highly secure data centre. Company has begun early to implement Green IS measures, prior to regulatory requirements. Currently, the topic of Green IS plays a strategic role within the organization. Especially for this purpose, this company pursues a holistic approach by having established a “Green IS approach” with eight members, each responsible for a particular working area (e.g. procurement, data centre, product management, office environment, sales etc.). This interdisciplinary team develops measures and recommendations, ensuring a cross divisional adoption and implementation of Green IT practices and encouraging company-wide energy efficiency improvements as well as environmental awareness. Interviewee clearly specified:

“Our Company at this moment not considering switching to green data centers unless it is a requirement. We are spending our time and resources on another project. We have to consider a computer laboratory for training purposes and we are trying to find ways to buy equipments that are energy efficient. We did consider going green on data centers and chances are that will be our next focus”. (IT Executive, Company B-IT & Telecommunication, Appendix- B)

- **Management Issues:** Due to the significant electricity consumption of servers, the data centre is in the focus of numerous Green IS practices. Most companies are not unconditionally concerned with environmental aspects and motivated to protect the environment. They are rather carefully balancing benefits based on operational cost decreases, product differentiation and improvements of firm reputation against required investment expenses. But rising energy and resource costs are continuously enhancing the business case of Green IS. The interviewee indicated also that almost all IT organizations are in some kind of dialogue with stakeholders about Green IS. More and more sustainability reports feature Green IS related aspects to communicate the organizations activities to stakeholders. Moreover, some companies favour environmental initiatives to advance their innovation competencies or to reposition their products in the market. Another driver is the revenue growth potential of Green IS. In combination with appropriate marketing strategies, environmentally-friendly products and services are becoming increasingly favoured by consumers corporate sustainability can contribute to differentiate from competitors.
- **Corporate Social Responsibility and Business success:** Green IS initiatives entirely target cost and risk reductions while neglecting the significance of an overall sustainability/Green IT strategy in IT management. Although IT strategies are defined in most cases, Green IS is not always reasonably integrated into these strategies. No matter, companies are trying to decrease their environmental impact by applying uncoordinated environmental measures and the analyzed IT service providers still lack a consistent environmental strategy being complementary to the business activities. As revealed by the Interviewee, Green IT practices can indeed have the capability to leverage firm competitiveness, but the corporate social responsibility results indicate that this strategic potential is largely disregarded. Interviewee said:

“The objective of IT management in regards to transformation in our company is constantly developed to technologies that are greener. We strive for excellence in what we do in every aspect so wanting a better greener technology is always a priority”.(IT Executive, Company B-IT & Telecommunication, Appendix- B)

By implementing consistent Green IS initiatives, competitive advantage could be created if Green IS is addressed as a corporate social responsibility issue and integrated into the concept of IT strategy. However, the other interviewees are emphasized that the interrelation of business strategy, sustainability goals and IT constitutes a complex challenge.

4.3 Green IS Sustainability and environmental strategies

(Green IS for efficiency- transformation-Innovation-responsibility)

The *Green IS for efficiency* alignment perspective stands for the eco-efficiency environmental strategy. The companies’ business strategy is the driving force and promotes superior resource productivity. This strategy objective to achieve competitive advantage on the basis of a low-cost approach and focuses on the internal infrastructure and processes.

“The investment objective of the Green IS is to achieve long term capital appreciation through company’s IT strategy. If there are any changes in the IT strategy, the Investment will endeavor to reflect the changes in the company’s business strategy”.(CEO, Company A, Appendix- A)

“Green IS investment can result in preventing pollution, product stewardship; have cleaner technology to enhance competitive advantage. Positive impact on the environment alone is endless”. (IT Executive, Company B, Appendix-B)

Green IS for transformation is driven by the eco-branding competitive environmental strategy, which aims at product and service differentiation based on environmental attributes. Green IS serves as crucial strategy enabler and Green IS-related opportunities are thoroughly considered by the top management. The sustainability IT management strives for environmental technology leadership and exploits the full environmental potential of the latest technologies. The companies IT management is responsible for the development of environmental technologies that facilitate a state-of-the-art Green IS infrastructure.

“IT management can take responsibility by looking into these different Green IS strategies and take ownership of these programs by implementing them and executing them flawlessly”.(IT Executive, Company B, Appendix- B)

Green IS for innovation conforms to the environmental cost leadership strategy, which refers to a product focus while following a low-cost strategy. The top management seeks for business and sustainability opportunities which are based on innovative technologies. *Green IS for responsibility*. It is associated with the beyond compliance leadership environmental strategy, which has an extended scope covering the entire range of internal processes of companies business strategy with the goal of sustainability-based competitive differentiation. *“The essence of the objective of IT management is participative goal setting, choosing course of actions and decision making. An important part of our company objective of IT management is finding out Green IS measure and developing green technologies through green IS transformation”. (IT Manager, Company A, Appendix A)*

4.5 Summary

Based on these empirical findings it becomes obvious that there is a need for consistent Green IS measures that support competitive environmental strategies for selected companies and organization. For this reason, the next chapter I have discussed about the identification of an adequate Green IS measures based on proposed conceptual framework that leverages sustainability and companies' competitiveness. The growing concern with the environment and its impact made by organizations turned ample organizations into challenging themselves to find ways to going green. Interviewing three different organizations shows how they found ways to adapt to activities that are environmental friendly. There are several variables that play into role when organizations focus on business strategies that align with cleaner environment goals. First one is competitiveness which gives the organizations the advantage of long term profitability. Second is Management Issues which essentially find ways to reduce cost and improve operational efficiency. Third is legitimating, in which an organization set ground policies which reflect their goals on tackling environment issues and avoid any penalties while at the same time find ways to save money. Fourth is corporate responsibility which refers to any business decisions that comply with legal requirements, ethical values and be responsible for making decisions that are rightfully beneficial to the community.

These interviews imply that in developing countries , organizations all around the world are taking great strides at reaching a common goal and that is, to have cleaner environment by following certain Green IS framework or structure, to be efficient in at all stages and sectors of their business and find ways to reduce cost. While it is obvious that there are lot of steps that can be undertaken to go green that organizations are yet to take advantage off , identifying opportunities with Green IS is the primary stage that puts these organizations into perspective in setting goals that help them prevent pollution which find ways to reduce greenhouse emissions and save cost in electricity, product stewardship which focuses in recycling products and adoption of cleaner technology which essentially means constantly finding ways to adopt to better technology which helps the environment. As more opportunities are being identified and it is common knowledge, in which ways companies can take advantage through Green IS measures, it is then; we will see a general shift from less to more participation in this subject matter which is very vital to our environment and the community. It is a great relief to see how different organizations are getting involved to have a sustainable future and it seems as though the trend of recognizing the need for organizations to be actively involved in sustainability with Green IS measures are very positive which leads me to believe that this subject matter is under the radar and companies are taking steps to make sure they implementing different strategies and measures to help their companies achieve sustainability goals.

5. ANALYSIS AND DISCUSSION

Considering the research question of why and how organizations implement Green IS measures, the qualitative case study method (Yin 2009) allows me to get an in-depth view on Green IS implementation practices. The selection of three cases facilitates data for a cross sectional analysis for studying various organizational types and their strategic direction. This research approach provides insights into diverse strategy types, thus illustrating the challenges of Green IS adoption. The methods of data collection were document analysis and face-to-face interviews with subject matter experts, such as CIOs, IT executive, IS and environmental managers. In this research the interviews were based on a structured interview guideline, conducted by myself to ensure the reliability of findings by convergence of observations (Eisenhardt 1989) and were recorded. The transliterated interviews were analyzed using content analysis. Because of the small sample of two cases, the findings and the generalisability are limited. Nevertheless the results indicate possible relations and give empirical information about the topic of this research.

5.1 Case 1 – Company A

Case 1 deals with a global Software solution located in Dhaka. They offer both onsite and offshore software services throughout the world. As a well-known software company, they committed itself to sustainable business principles. The corporate sustainability strategy is focused on environmental protection that related with pollution prevention, product stewardship and adoption of cleaner technology, and CSR (Corporate social responsibility) management. With the goal of operating all business processes in a climate neutral way, they set up a company-wide strategy to promote climate and environmental responsibility internally and externally towards its stakeholders. For this purpose, they have defined specific targets, areas of action, and measures for the environmental operations teams striving for an environment-conscious use of resources, to increase the purchase of renewable energies and to improve the energy efficiency of the technological infrastructure. As a contribution to the climate neutral operations strategy of the company, the IT department initialized the Green IS program. The main purpose of the program are to ensure that the used IT applications and the infrastructure are resource-efficient during their whole life cycle, to improve the IT energy efficiency in the data centres and to reduce the energy consumed by IT activities in the office environment.

5.2 Case 2 – Company B (IT and Telecommunication)

Company B is an IT and telecommunication service provider and part of a large corporate group. The company's core activities are the provision and support of IT infrastructure solutions. The company is committed to the concept of sustainable development that is lead to Green IS issue and pursues a sustainability strategy with special regard to the principles of the United Nations Global Compact. This company loyalty is carried out through the entire value chain towards all the stakeholders, especially the employees, customers, suppliers and stockholders. A detailed report in terms of defined objectives and performance indicators is presented in an annually published sustainability report. The company and service companies have been trying to be integrated into the sustainability program. To support the sustainability targets of the corporate group, company initialized the “Green IS project”. The scope of this project is to develop measures designed to optimize processes and software and to roll out energy

efficient server installation concepts. Furthermore, resource-friendly configuration of IT workstations and adopting a more restrained approach to the use of printers are additional objectives.

5.3 Cross-sectored case study analysis

The results of the cross-case analysis are summarized in table 3.1 and table 3.2 to illustrate the strategic direction of the Green IS/sustainability practices of the two different companies. To draw conclusions from the results of the case studies, I structure the data that was gathered through semi-formal interviews according to the relevant aspects that were identified in the literature review of chapter 2. As displayed in table 3.1, the conducted interviews initially focused on the strategic integration of sustainability aspects throughout the organization, thus referring to the argumentation of section 2.2, which revealed the strategic relevance of environmentalism. The Green IS strategy section of table 5.3 illustrates the characteristics of the alignment of Green IS measures in the companies that were analyzed in the scope of the multiple-case study. The interviews revealed whether the Green IS initiatives of the companies support the sustainability goals of the corporation. The drivers of Green IS implementation are identified and classified on the basis of the literature review of section 2.1. Furthermore I analyzed how Green IS is supposed to enhance competitiveness along the dimensions of Orsato's competitive environmental strategies that were explained in section 2.2.

Table 5.1: Results of cross-sectored case study analysis based on RQ 2

	Case 1 Company A	Case 2 Company B	
Green IS Sustainability and environmental strategies			
(RQ 2: How can Green IS support competitive environmental strategies)			
Sustainability is an integral part of corporate strategy- (Competitiveness)	YES	YES	
Environmental goals defined (Management Issue)	YES	YES	
Environmental competitive strategy developed(Corporate Social Responsibility)	YES	NO	
Type of environmental competitive strategy (according to Orsato 2009)	Eco-efficiency, eco-branding	Not defined; Concentring cost savings	

Table 5.2: Results of cross-sectored case study analysis based on RQ 1

	Case 1 Company A	Case 2 Company B	
Green IS Strategy (RQ 1: Why and how do organizations Implement Green IS measures?)			
Green IS strategy defined	YES	YES	
Green IS is part of the IT strategy	YES	YES	
Green IS strategy is lined up with sustainability goals	YES	NO	
Drivers of Green IS measures	Cost savings	Cost savings	
	Reputation	Corporate citizenship	
	Top management	Regulatory compliance	
	Company values	Economic opportunities	
Green IS investments follow Pollution prevention, Product stewardship and adoption of cleaner Technology to enhance competitive advantage	YES	NO	
Competitive advantage of implementing Green IS measures	Low Cost	No Focus	
Competitive focus of implementing Green IS measures	Internal Process	Products and services	

Based on the empirical findings, in the three analyzed organizations, Green IS has been implemented on the basis of a variety of different measures in some cases the measure were very new about Green IS. Each organization has defined environmental goals to reduce its overall environmental footprint to contribute to the attenuation of the possible impacts of climate change. However, Green IS initiatives mainly aim at reducing operational costs by decreasing resource consumption. In addition to, the companies strive for a positive reputation of the enterprise and want to prevent restrictive regulation by legislation, for example strict laws for IT-related CO2 emissions. To complete, Green IS implementation and cooperation with stakeholder groups, the companies hope to minimize the risk of restrictive governmental regulations, which would come along with higher production costs. Through Green IS initiatives, respective companies are expecting to influence and direct policy and regulation. The reason of significant electricity consumption of servers, the companies' data centre is in the focus of numerous Green IS practices. Most companies are not unconditionally concerned with environmental aspects and motivated to protect the environment. They are rather carefully balancing benefits based on operational cost decreases, product differentiation and improvements of organization reputation against required investment expenses. But rising energy and resource costs are continuously enhancing the business case of Green IS.

The companies CEO's indicated also that almost all reputed private organizations are in some sort of dialogue with stakeholders about Green IS. Progressively sustainability reports feature Green IS related aspects to communicate the organizations' activities to stakeholders. Furthermore, some companies favour environmental initiatives to advance their innovation competencies or to reposition their products in the market. Another driver is the revenue growth potential of Green IS. In combination with appropriate marketing strategies, environmentally-friendly products and services are becoming increasingly favoured by consumers and corporate sustainability can contribute to differentiate from competitors. Notwithstanding, Green IS initiatives entirely target cost and risk reductions while neglecting the significance of an overall Green IS strategy / sustainability in IT management. Although IT strategies are defined in most cases, Green IS is not always reasonably integrated into these strategies. Regardless, companies are trying to decrease their environmental impact in order to apply uncoordinated environmental measures and the analyzed IT service providers still lack a consistent environmental strategy being complementary to the business activities. As revealed by the literature review, Green IS practices can indeed have the capability to leverage companies' competitiveness, but the case study results indicate that this strategic potential is largely ignored. Through implementing consistent Green IS initiatives, competitive advantage could be created only if Green IS is addressed as a strategic issue and integrated into the concept of companies IT strategy. However, most of IT managers emphasized that the interrelation of business strategy, sustainability goals and IT constitutes a complex challenge.

5.5 Perspective 1: Green IS for efficiency

The *Green IS for efficiency* alignment perspective stands for the eco-efficiency environmental strategy. The companies' business strategy is the driving force and promotes superior resource productivity. This strategy objective to achieve competitive advantage on the basis of a low-cost approach and focuses on the internal infrastructure and processes. As a consequence, the environmental strategy has a firm wide scope and the efficiency of business operations is a major goal. Sustainability is regarded from a cost perspective and Green IS measures are implemented if they allow for superior efficiency, coming along with operational cost decreases. The environmental strategy corresponds to business requirements and the IS is guided by this strategy. The alignment logic reveals that environmental practices targeting the organizational infrastructure are determined by the competitive environmental strategy, which demands for efficient business processes. This efficiency focus sets the terms for the implementation of Green IS practices.

5.6 Perspective 2: Green IS for transformation

The second perspective, designated *Green IS for transformation* is driven by the eco-branding competitive environmental strategy, which aims at product and service differentiation based on environmental attributes. These environmental products usually target niche markets and customers that are willing to pay for the costs of environmental differentiation. Green IS serves as crucial strategy enabler and Green IS-related opportunities are thoroughly considered by the top management. The sustainability IT management strives for environmental technology leadership and exploits the full environmental potential of the latest technologies. The companies IT management is responsible for the development of environmental technologies that facilitate a state-of-the-art Green IS infrastructure. Innovative IS solutions are an integral part of the product or service and the environmental characteristics are appreciated by the customers. The alignment logic brings out the Green IS strategy enables the competitive strategy on the basis of a specific Green IS infrastructure, which is not constrained by the organizational infrastructure.

5.7 Perspective 3: Green IS for innovation

The third alignment perspective *Green IS for innovation* conforms to the environmental cost leadership strategy, which refers to a product focus while following a low-cost strategy. This strategy is associated with radical product innovations instead of incremental process improvements and it is appropriate if the companies strive simultaneously for the lowest environmental impact and the lowest production costs within its competitive environment. The identifying key determinants of “green” innovation require analysis of the effects of environmental regulation alongside market and firm-internal conditions. This can only be accomplished through radical technological innovations, which are anticipated by a visionary top management that is committed to environmentalism and targets business leadership at the same time. As a result, the Green IS strategy should leverage innovations and drives the competitive environmental strategy. The top management seeks for business and sustainability opportunities which are based on innovative technologies. The companies IT management regards environmental technology trends and

analyses their impact for the business in close cooperation with the top management. Green IS management influences the business and sustainability strategy as well as product characteristics while the environmental practices change the organizational processes fundamentally.

5.8 Perspective 4: Green IS for responsibility

The fourth alignment perspective is called *Green IS for responsibility*. It is associated with “the beyond compliance leadership environmental strategy”, which has an extended scope covering the entire range of internal processes of companies business strategy with the goal of sustainability-based competitive differentiation. The key performance criteria are oriented towards stakeholder satisfaction while the companies IT management plays an important role for executive leadership. The top management and the sustainability management facilitate direction, analyze stakeholder claims and prioritize investments. The Green IS strategy strives for a high quality, low-impact IT infrastructure that enhances the process efficiency of the whole organization. Green IS promotes the extraordinary environmental dedication and even unprofitable investments that allow for further emission reductions are recognized. This gives the companies a first mover advantage in the field of sustainability, shaping the shopping behavior of customers and resulting in an outstanding company reputation.

Table 5.3: Characteristics of the Green IS alignment perspectives.

Table 3.1 Table 3.2	Perspective 1 Green IS for efficiency	Perspective 2 Green IS for transformation	Perspective 3 Green IS for innovation	Perspective 4 Green IS for responsibility
	Competitive environmental strategy	Eco-efficiency	Eco-branding	Environmental cost leadership
Competitive advantage	Low-cost	Differentiation	Low-cost	Differentiation
Competitive focus	Internal processes	Products and services	Products and services	Internal processes
Objective of sustainability management	Support business strategy	Differentiate from competition	Become Industry leader	Carry out stakeholder claims
Objective of IT management	Implement business strategy	Develop green technologies	Drive ecological innovations	Minimize environmental impact
Performance criteria	Cost/service centre	Environmental technology leadership	Business leadership	Stakeholder satisfaction

6. CONCLUSION

In this paper, I have studied the strategic impact as well as the underlying dimensions of Green IS on the basis of an extensive literature review. I stated that competitive advantage can be achieved by either lowering costs or providing differentiation. Practitioners must acknowledge that strategy is always a question of choice, which comes along with trade-off decisions. A consistent Green IS strategy that creates sustainable competitive advantage necessitates the consideration of technological and environmental aspects. Utilizing the vast scope of technology can be a means of addressing our global problem. By leveraging technology into environmentally friendlier activities may be our biggest scope in the history of commerce. Many organizations are now aligning sustainability to corporate or business strategy which addresses our global problem. It requires sustainable business practices because of the significant role organizations play in our community in the global economy. Green IS and IT is a major element that can play a vital role in transitioning in to a sustainable economy.

In this research, I had looked into the immediate threat that we all pose to the environment and how I believe the concept of Green IS can assist private organizations promote sustainable environment while at the same time align their business needs and goals and their morale values and responsibilities to the society. The opportunities with Green IS are vast but it all boils down to three major significant key areas. They are Pollution prevention, Product stewardship and Clean technology. We need to be able to adapt to the stakeholder's and the community's needs for 'greener' environment by being more responsive in exploiting the concept of Green IS. We need to adapt to environmental initiatives that will help us reduce waste and emissions in our community. Fortunately, private companies are learning that there are activities that they can undertake to help the environment. Some companies have used the current knowledge as a stepping stone and turned their companies into undertaking great responsibilities and activities which is favorable to the environment. On the other hand, some organizations are not active in this subject matter. They comprehend the significance of this issue at hand but yet have not taken steps to correct its ways. We need to attain sustainable development, which will meet the needs of our present day demands without compromising the demand for future propagations.

The key comprehension of organizations about Green IS is very significant. Organizations needs to view Green IS and sustainability development not as cost to the company but rather, opportunities for them to improve on productivity, enhance profitability and reduce costs. Organizations that are actively pursuing Green IS are diverting their focus on sustainability, which are doing the right thing for their community, investors, customers and their future generations. Organizations are constantly finding ways to evolve to the fast paced economy that we live in today. They welcome any technology or invention that reduces their cost by combining activities that encourage efficiency. There is another key factor organizations have to take into consideration when aligning their business strategies and that is to aggressively find ways and consider technologies to promote sustainability and reduce emissions and waste.

As exposed by the multiple-case analysis, the topic of strategic Green IS alignment is highly relevant, especially because Green IS still consists of the implementation of unorganized measures while the strategic potential of environmental technologies is neglected. The proposed framework for strategic Green IS alignment can help to develop a consistent Green IS strategy. It identifies between the internal and external perspective, which are aligned by the concept of strategic fit, while the Green IS and

environmental sustainability domain are aligned through functional integration. The proposed Green IS alignment perspectives, *Green IS for efficiency*, *Green IS for transformation*, *Green IS for innovation*, or *Green IS for responsibility*, are selected according to the companies sustainability goals and competitive orientation. However, this research is only a first step towards a rigorous approach of Green IS alignment. The small sample of three cases provides only a limited overview of company practices. In order to get a representative sample and to advance the applicability and validity of the suggested alignment procedure, an extension of the sample size is strongly needed. In particular, more private organizations especially internal IT service providers and/or IT telecommunication departments and their strategic alignment logic should be studied in order to verify, to refine, and, where appropriate, extend this research.

Finally, we need to keep in mind that there are finite amount of natural resources and the rate at which we are currently depleting our resources are very alarming. We need to think about our future generations and find ways not to degrade the environment in which we live in, which ultimately affects both this and generations to come ahead of us. My interviews with various companies show that a lot of the organizations are on the right path to a more sustainable environment whereas there are others that need to take that step forward to make a difference. I hope we all realize the significance of this matter at hand and have every organization on the pace that we all need to be before it is too late for our environment and generations to come.

Appendix -A, Interview with Company A

Location: Head office.

Department: Software Development.

Interviewee: CEO and Senior IT manager.

Date: 17 March, 2011

PART 1

Question 1: Would your company consider switching to green data centers without a regulatory push?

CEO: At this point it's still a bit more difficult. Yes, there is a lot of awareness that there is a big issue here but there's not a lot of data to go on about how to change.

IT Manager: A lot of CIOs and IT managers don't have responsibility for power consumption. As a function of how the data centers are evolving, IT managers are starting to realize that they are going to have to take responsibility for power consumption. A lot of larger data centers now are running out of power capacity with the servers drawing much more power than they used to. There's a lot of awareness that this is going to be a big issue. If they have a responsibility for power consumption, it's an opportunity for them to demonstrate a lot of cost savings in terms of electricity bills and if you're going to use something like virtualization, you're going to be looking at reduced purchase cost for new equipment. The benefit is there regardless of whether there's going to be regulations in effect.

Question 2: When buying computers and peripherals does your company consider in terms of the product lifecycle, and recycling issues upfront?

CEO: The quality of the questions varies considerably, some people know what they need to ask and other people put something very simple. It's not just the question do you do recycling, you've got to ask how do you do recycling. We differentiate ourselves by offering not that much of high standards of environmentally-sound recycling like developed countries. In fact there is no such a waste management companies are currently available here.

Question 3: How does your company care about sustainable IT management and use?

CEO: Yes, we are very much care about sustainable IT management and use. Sustainable IT management and use has to do with the way a company manages its IT assets and we are care about this matter.

IT Manager: Sustainable IT management includes purchasing energy-efficient desktops, notebooks, servers and other IT equipment, as well as managing the power consumption of that equipment. It also refers to the environmentally safe disposal of that equipment, through recycling or donation at the end of its lifecycle.

Question 4: In what ways is your company showing concern in regards to sustainable IT disposal?

IT Manager: Sustainable IT disposal refers to the safe disposal of IT assets. It ensures that old computer equipment does not end up in a landfill, where the toxic substances it contains can leach into groundwater, among other problems. Many of the major hardware manufacturers offer take-back programs, so IT departments don't have to take responsibility for disposal.

Question 5: Do you really think that video conferencing is a viable green alternative for long distance communication?

CEO: *Video conferencing* is the cheapest way, and often free, to *communicate* over country, it's completely *viable* way to conduct business *very* cheaply over *long distances*. Effective video conference technology solutions, combined with knowledgeable users, can reduce the amount of travel for many companies. The technology solution has to be easy to use, easy to configure, easy to manage and run on standard corporate and public IP-based networks, without taking too much bandwidth

IT Manager: VoIP technologies can have a faster positive impact than videoconference. We use MSN where we have the telephone call with the video and sharing files. Its desktop stuff that's free and relatively straight-forward.

Question 6: Do your company aware of the benefits of Cloud computing for a new data center?

CEO: Business applications are moving to the cloud. It's not just a fad the shift from traditional software models to the Internet has steadily gained momentum over the last 10 years. With cloud computing, we are able to eliminate those headaches because we're not managing hardware and software—that's the responsibility of an experienced reliable vendor. The shared infrastructure means it works like a utility that you only pay for what you need, upgrades are automatic, and scaling up or down is easy. Businesses are running all kinds of apps in the cloud, like customer relationship management (CRM), HR, accounting, and much more. Our company is very much aware of Cloud computing and all types of new technology.

IT Manager: Cloud-based apps can be up and running in days or weeks, and they cost less. With a cloud app, you just open a browser, log in, customize the app, and start using it. As cloud computing grows in popularity, thousands of companies are simply rebranding their non-cloud products and services as “cloud computing.” Always dig deeper when evaluating cloud offerings and keep in mind that if you have to buy and manage hardware and software, what you're looking at isn't really cloud computing but a false cloud. Our company is looking forward to adopting this feature.

Question 7: How do you ensure recycling IT equipments for your company?

CEO: IT Trading - Recycle IT Equipment - Computer Recycling - Laptop Recycling those are such a big issue for every IT companies. Certain pieces of IT equipment, such as computer monitors, are classed as hazardous waste and cannot legally be disposed of with general waste. Secure IT recycling specializes in the Secure Collection and Disposal of redundant I.T. Equipment. Our organization has not done yet any agreement with “Waste management Company”. But we are very concern about recycling IT equipments and our IT experts’ r doing work on this issue.

Question 8: What affordable steps Can Company/Organization take to green their data centers?

IT Manager: There are many different things that we can do. The first one is the consolidation of multiple data canthers into a few or, better yet, one. The fewer facilities we have the greater our opportunity is to maximize our efficiencies in a single facility or in fewer facilities.

The second thing and something gaining in popularity is in virtualization. Taking our servers and rather than just keep adding more servers to run more applications trying to utilize the capability of each server more effectively so that we could maximize potential to provide applications to our business.

The third one that people don't tend to talk about a lot is that every company often has a main data centre and then they have disaster recovery sites, which are not utilized very often. One of the great ways to save power and facility space is to consider co-location for those disaster recovery sites.

Question 9: How does your company reduce electricity consumption on the desktop PCs?

CEO: Managing Desktop Power Consumption, the most obvious problem with turning off an organization’s computers when they’re not in use is that IT departments need the not-in-use periods to perform routine maintenance such as patching and installing updates. If an organization’s workstations have been shut down manually or via standard operating system functionality, maintenance is impossible. Power Save solves this problem with a Wake-on-LAN (WOL) feature that allows IT departments to boot desktop computers for scheduled maintenance whenever desired. WOL can also be used to ensure that all systems are turned on and ready to use as soon as employees arrive in the morning.

IT Manager: Economical options are available for all IT companies wanting to reduce power consumption and promote conservation regarding IT initiatives called “server virtualization.”By doing this we are expecting about 70 per cent reduction in power consumption, an 80 per cent reduction in cooling requirements, and thousands of money in cost savings.

Question 10: Can you discuss the disadvantages of cloud computing for organization/companies?

CEO: Cloud computing is hot but severe business risks and challenges are involved to retrieve the promised business advantages of cloud computing. The main disadvantages are Security, Loss of control, Unstable cost structure, potentially decreased business flexibility, integration problems.

IT Manager: To the proper utilization of Cloud computing, organizational changes are needed for adapting the technology such as procedures, skills, business model. Cloud computing technologies and business models have not yet reached maturity and Standards are being developed.

PART 2

Question 11: Is Green IS part of the IT strategy?

- YES
- NO

CEO: YES, Green IS is a part of our IT strategy. Because of company reputation.

Question 12: Does your company consider sustainability goals that reflect Green IS strategy?

IT Manager: Waste Management offers several solutions that can lead our company on the path to sustainability. Our experts will work with our leadership to help tackle and resolve any environmental concerns that are important to our business. Whatever our challenges, Waste Management can assist us in devising an overall strategy so that we can achieve our sustainability goals without sacrificing your financial objectives.

Question 13: What are the outcomes of Green IS investments?

CEO: The investment objective of the Green IS is to achieve long term capital appreciation through company's IT strategy. If there are any changes in the IT strategy, the Investment will endeavor to reflect the changes in the company's business strategy.

Question 14: How can IT management take responsibility on the impact of the environment?

IT Manager: Through the Corporate Social Responsibility. The goal of CSR is to embrace responsibility for the company's actions and encourage a positive impact through its activities on the environment, consumers, employees, communities, stakeholders and all other members of the public sphere. In addition, CSR is titled to aid an organization's mission as well as a guide to what the company stands for and will uphold to its consumers. Development business ethics is one of the forms of applied ethics that examines ethical principles and moral or ethical problems that can arise in a business environment.

Question 15: What is the objective of IT management in regards to transformation?

IT Manager: The essence of the *objective of IT management* is participative goal setting, choosing course of actions and decision making. An important part of our company *objective of IT management* is finding out Green IS measure and developing green technologies through green IS transformation.

Appendix -B, Interview with Company B

Location: Head office.

Department: IT and Telecommunication.

Interviewee: Senior IT manager and IT executives.

Date: 24 March, 2011.

PART 1

Question 1: Would your company consider switching to green data centers without a regulatory push?

IT Executive: Our Company at this moment not considering switching to green data centers unless it is a requirement. We are spending our time and resources on another project. We have to consider a computer laboratory for training purposes and we are trying to find ways to buy equipments that are energy efficient. We did consider going green on data centers and chances are that will be our next focus.

Question 2: When buying computers and peripherals does your company consider in terms of the product lifecycle, and recycling issues upfront?

IT Executive: As mentioned earlier, we are considering buying certified energy efficient computers which may cost a little bit more but upfront but in the long run it will be better for us. We, for obvious reasons like to consider product lifecycle that way we can get more use out of a product we buy. We normally do not consider recycling issues when we purchase equipment. We take care of it when it is time to dispose of it.

Question 3: How does your company care about sustainable IT management and use?

IT Executive: Our Company has always cared for sustainable IT management and use. We always align our business strategies with IT management and set priorities based on that. Being sustainable, it will allow us to maintain a certain status in an existing system. We tend to step away from short term benefits and always think of long term to achieve our goals

Question 4: In what ways is your company showing concern in regards to sustainable IT disposal?

IT Executive: We dispose of our equipments properly by using a company who is certified to do so. They are called Retire it. All you do is ship the equipment out to them and they take care of it for u. Interesting part of that company is that you are able to track your equipment on every stage of the process till it is totally disposed off.

Question 5: Do you really think that video conferencing is a viable green alternative for long distance communication?

IT Executive: Video conferencing is a viable green alternative because as long as you have the proper equipments to video conference it is relatively cheap and economical then any other methods. The only down fall is that sometimes the quality of the video is not that great and people miss the one on one communication.

Question 6: Do your company aware of the benefits of Cloud computing for a new data center?

IT Executive: We are fully aware of the benefits of the cloud computing in data centers. We know very well that cloud computing allow us to share resources, software, and information to computers over a network but we are yet to utilize that method. We hope to implement that in less then a year.

Question 7: How do you ensure recycling IT equipments for your company?

IT Executive: We have a bin in our backroom office space where we pile up equipments that needs to be disposed of. When the bin is full we utilize a company called Retire it who dispose of it properly. We also donate to Salvation Army on certain equipments that are reusable.

Question 8: What affordable steps Can Company/Organization take to green their data centers?

IT Executive: First we have chosen which of the four methods we want to utilize. There are public, community, hybrid or private cloud. Each has its own pros and cons associated with it but when we are ready to use this service we will chose based on efficiency and cost. We are also aware that energy efficiency in cloud computing can result from energy-aware scheduling and server consolidation. We will consider other factors too when we utilize cloud computing methods.

Question 9: How does your company reduce electricity consumption on the desktop PCs?

IT Executive: The only thing we do for reducing electricity consumption on desktop PS s is that we make sure everything is turned off when we are gone for the night. Some of our associates find it inconvenient but I expect them to take couple of minutes each day reboot the system when they come in and turn off when they leave for the day entirely.

Question 10: Can you discuss the disadvantages of cloud computing for organization/companies?

IT Executive (1): The benefits to cloud computing are cost reduction, increased storage, it is highly automated, obviously more mobility (access to information wherever you are) and it allows IT to shift focus (for example- no constant server updates or computer issues). They will be able to focus on innovations rather then these issues. The disadvantages are security and privacy concerns, dependency (quality problems with cloud service providers), and higher cost in the short run, Knowledge and

integration (more knowledge is required to implement and manage contracts with cloud service providers). Integration (Integration with equipments hosted in other data centers is difficult to achieve).

PART 2

Question 11: Is Green IS part of the IT strategy?

- YES
- NO

IT Executive: YES

Question 12: Does your company consider sustainability goals that reflect Green IS strategy?

IT Executive: Our Company does consider sustainability goals that reflect Green IS strategies.

Question 13: What are the outcomes of Green IS investments?

IT Executive: Outcomes of Green IS investments for our company have been very rewarding. We have our in-house store house and bunkers turn on lights when the motion detector detects activity in front of the store house and turns off the lights when store managers walk away from it. We also utilize power efficiently by installing solar lights where during the day time our power is generated based on solar which on the long run saves us money too.

Question 14: How can IT management take responsibility on the impact of the environment?

IT Executive: IT management in our company can take responsibility for the environment by making sure that we implement and execute the appropriate green IS strategies that has a positive impact on our environment that is why we hire third party company who are unbiased and whose job is to visit one store to another and rate the branches based on their level of execution. This company also points out any non compliance issues that need to be addressed immediately. By doing this, our company assures that there is someone in place to look over the execution of these strategies and that we are doing what we can to have a positive impact on the environment.

Question 15: What is the objective of IT management in regards to transformation?

IT Executive: The objective of IT management in regards to transformation in our company is constantly developed to technologies that are greener. We strive for excellence in what we do in every aspect so wanting a better greener technology is always a priority. They also look for ways to be efficient with the given recourses they have on hand and at the same time we try to be cost efficient too. Our company has a lot Green IS strategies in place as mentioned before but ultimately the objective is going to be to strive for more better and efficient ways to transform into Green IS based company.

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