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Research Article

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How An Organization's Environmental Orientation Impacts Environmental Performance through Green Computing Hiring Practices

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Abstract:-*This research uses the logic embodied in Strategic Fit Theory, the Natural Resource-Based View of the Firm (NRBV), strategic human resource management, and other relevant literature to empirically demonstrate how the environmental orientation of a firm's strategy impacts their environmental performance through the firm's Information Technology hiring practices. Specifically, it was hypothesized that firms with a strong relationship between their environmental orientation and their green computing hiring practices will achieve higher environmental performance than firms lacking such fit.*

The sample size of firms is fairly large, increasing the statistical power of the empirical tests. The combination of using a large sample of real world firms, a powerful combination of qualitative and quantitative methodological techniques to tap into key trace evidence not available through other methodological techniques, and leveraging a recognized environmental data set has enhanced the robustness of the empirical findings in addressing this important gap in the literature.

The results of the analyses show that there is a strong relationship between an organization's environmental posturing and its environmental performance. Additionally, this effect is mediated by the organization's environmental hiring practices, indicating that implementing the organization's environmental strategy through its hiring practices is important in achieving improved environmental performance.

Keywords: *Environmental Sustainability, Green IT, Resource-Based View (RBV), Natural Resource-Based View (NRBV), Strategic Fit, Strategic Human Resource Management, Knowledge-Based View, Content Analysis*

Introduction

Environmental concerns are at the forefront of today's social anxiety. There are hundreds of laws and treaties pending, and organizations are at the center of both the causes and the solutions to today's environmental crisis (Carroll & Bucholtz, 2006). This research attempts to provide empirical evidence as to whether or not a relationship between an organization's assertions about its environmental practices and its environmental performance exists and whether other actions affect that relationship. Unfortunately, many researchers dealing with environmental issues espouse a point of view relating to these issues that pursues a particular ideological path along moral and ethical grounds. These articles often focus on prescriptive measures to be taken by an organization to address environmental concerns (Banerjee, 2002) utilizing anecdotal evidence instead of proposing hypotheses of relationships and testing whether or not they are supported.

1.1 Problem Statement

While more people acknowledge that climate change exists and are concerned about the ecological environment, organizations have subsequently ensued on a public relations campaign to highlight their environmental friendliness in an effort to enhance their corporate image (Parguel,

Benoit-Moreau, & Larceneux, 2009; Porter & Kramer, 2006) and address ever increasing societal requirements for increased environmental accountability (Al-Tuwaijri, Christensen, & Hughes II, 2004). Unfortunately, many of the claims made by organizations to the public are not exactly what they purport regarding their commitment to improving the environment (known as "greenwashing" (Marquis, Toffel, & Zhou, 2016)). Because many of these claims come from organizations known to have contributed to significant environmental problems, the public and stakeholder groups have often become skeptical about their claims of environmental friendliness that makes truthful statements by organizations less effective (Parguel, Benoit-Moreau, & Larceneux, 2009; Banerjee, 2002).

However, as businesses have become aware of the concern the public has for preserving our natural environment, they have faced considerable difficulty understanding what to do about the problems. Consequently, the response from many organizations has been to promote their environmental stewardship prior to accomplishing anything strategic or operational to actually address the issue. As of 2014, 93% of the 250 largest multinational corporations had published Corporate Social Responsibility (CSR) reports within their annual report or in a standalone CSR report (Nelson, 2014). How these CSR reports have impacted organizations' environmental performance is unclear. There has been little consistency in measuring the publicized environmental orientation and demonstrating a link it to its environmental performance.

1.2 Research Questions

This research addresses the following questions. Is there a relationship between the assertions of the top management team regarding its environmental focus and its organization's environmental performance? How do the hiring practices of the organization affect the environmental performance of the firm?

Literature Review

Much of the current literature that focuses on the theoretical nature of environmental stewardship has its foundation in a theory of the Natural Resource-Based View (NRBV) of the firm which is a natural extension of the Resource-Based View of the Firm (RBV). The NRBV specifically relates to those resources that can give an organization a competitive advantage based upon its relationship to the ecological environment (Hart, 1995).

2.1 Natural Resource-Based View of the Firm

Since the end of World War II, the population has grown from around 2 billion to almost 7 billion (World Bank, 2010). Additionally, use of fossil fuels has increased over 25 times and industrial production has increased over 40 times since WW II. The environmental impact of all of this activity has also increased inordinately. Pollution, toxic emissions, chemical spills, and other industrial accidents have created real crises for civilizations around the world. More carbon has been added to the atmosphere in the past 100 years than in the previous 18,000 which is producing climate changes and may cause other catastrophes such as coastal erosion/submersion, desertification, and erratic weather patterns (Hart, 1995; Sutherland & Woodroof, 2009).

The next few decades present unprecedented challenges. We must, consequently, alter the nature of industrial activity or risk irreversible damage to vital ecological systems. This opens up opportunities for organizations to alter their corporate strategy in ways that may even provide them with a competitive advantage over those organizations that do not (Hart, 1995).

The Natural Resource-Based View of the Firm (NRBV) is a natural extension of the RBV that specifically relates to those resources that can give an organization a competitive advantage based upon its relationship to the ecological environment. The RBV presumes that valuable and difficult to copy resources and capabilities are the primary sources for creating a sustainable competitive advantage. The resources particular to the NRBV revolve around three strategies interconnected with each

other: pollution prevention, product stewardship, and sustainable development (Hart, 1995) (See Table 1 below).

Table 1: A Natural Resource-Based View Conceptual Framework (Hart, 1995)

Strategic Capability	Environmental Driving Force	Key Resource	Competitive Advantage
Pollution Prevention	Minimize emissions, effluents, & waste	Continuous improvement	Lower costs
Product Stewardship	Minimize life-cycle cost of products	Stakeholder integration	Preempt competitors
Sustainable Development	Minimize environmental burden of firm growth and development	Shared vision	Future position

Resources must be difficult to replicate in order to sustain a competitive advantage. Resources can be difficult to replicate because they are tacit (causally ambiguous) or they can also be socially complex. Tacit resources are generally skill-based and dependent upon human resources (see the discussion in the section Strategic Human Resource Management). These knowledge-based types of resources are difficult to observe and based upon participation in the tasks where the particular knowledge is required. They are only created through experience and developed through continual use. Socially complex resources are dependent on large groups of people or teams working in coordination so that only a few people, if any, understand the entire task well enough to understand the entire phenomenon (Barney, 1991; Hart, 1995) and are also based on the unique personalities, experiences, and path dependent knowledge of the group (Michalisin, Karau, & Tangpong, 2004).

2.2 Strategic Fit

Certain organizational structures, cultures, and leadership styles are only appropriate in particular strategic situations. Essentially, "Strategic Fit" focuses on the degree of alignment between the current competitive environment, the organization's strategy, and its resources and capabilities (Hitt, Bierman, Shimizu, & Kochhar, 2001). Alignment in this context refers to the appropriateness of each of the different elements to one another. It is only when this alignment occurs that superior performance can ensue (Chorn, 1991; Venkatraman & Camillus, 1984; Amit & Schoemaker, 1993).

A significant component to strategic fit is determining how an organization is to succeed when the environment around them is changing. In the context of this research, it is how an organization changes in order to deal with the constraints imposed by the natural environment that is of primary focus (Zajac, Kraatz, & Bresser, 2000). In Zajac, et al.'s (2000) model of dynamic strategic fit, the connections between Environmental and Organizational contingencies impact the desirability to make a strategic change. When changes occur in the environment in which an organization is operating, that alone should not be enough to invoke a desire to change the organization's strategy. It must also be matched by the resources and capabilities in the organization or the organization must make requisite changes to their resources and capabilities.

Contingencies are then based upon understanding the industry to which an organization belongs and the organization's hiring practices to address its needs. In this context, environmental contingencies include changes in customer demands, government policy, competitors' actions, technological changes, and other changes external to the organization that impact the viability of the organizations current strategy. Organizational contingencies include the discovery that the organization lacks the resources or competencies required to successfully implement a part of its current strategy, necessitating changes

either to its strategy or its resources. Proper scanning and interpretation of the natural environment also ensures that organizations have the appropriate strategies and access to the appropriate resources necessary to implement those strategies (Sutherland & Woodroof, 2009)

Management teams may interpret problems in the natural environment as either threats or opportunities and may also believe that pressures from different stakeholder groups should impact their strategy. However, to maintain alignment between the exogenous business environment and the internal resources and capabilities, organizations should only carefully pursue a proactive environmental strategy (Aragon-Correa & Sharma, 2003). Given this representation of strategic fit, it is clear that not all situations call for a change in strategy for all organizations (even for environmental strategy).

2.3 Strategic Human Resource Management

Of the resources discussed in the context of the Resource-Based View of the Firm, human resources have received considerable attention. One of the reasons for all of this attention is that knowledge is generally tacit and located within the individual. One of the roles of an organization is to apply the knowledge of its human resources rather than creating the knowledge (Grant, 1996). Therefore, it is imperative that organizations hire workers with the knowledge it needs and has the capabilities to apply it. The individual human resources know how to do things (tacit knowledge) while the organization knows about things (explicit knowledge). According to Grant (2002), knowledge is the clearly the most critical resource in terms of increasing market value and accruing Ricardian rents. Leveraging of human resources has also been shown to have a positive effect on an organization's performance and moderating the relationship between the organization's strategy and its performance (Hitt, Bierman, Shimizu, & Kochhar, 2001).

2.3.1 Knowledge-based view of the firm

The distinction in the differences between the primary types of knowledge as it pertains to the Resource-Based View of the Firm is in its transferability. Explicit knowledge can be transferred relatively easily (once transcribed it can be utilized by others at a marginal cost). Tacit knowledge, however, is only revealed when it gets used. It is generally acquired through practice so its transferal is costly, slow, and unpredictable (Grant, 1996; Kogut & Zander, 1992).

According to Grant (1996), there is limited ability of the human brain to acquire, store, and process knowledge. Consequently, the creation of new knowledge or the acquisition of extant knowledge and their subsequent storage (i.e., knowledge production) requires personnel who specialize in the areas of knowledge being pursued. Therefore, the experts are almost always specialists in that specific area instead of people who have broader knowledge-base.

Consequently, human resource management (HRM) becomes even more imperative since as Simon (1991, p. 125) states: "All learning takes place inside individual human heads; an organization learns in only two ways: (a) by the learning of its members, or (b) by ingesting new members who have knowledge the organization didn't previously have". Of course one or the primary goals of successful HRM activities is to achieve both synergies with the organizational strategy (Zajac, Kraatz, & Bresser, 2000) and procure resources necessary to implement the organization's strategy (Barney, 1991).

Therefore, organizational capability explains its link with competitive advantage. Since employees are mobile, although their specialized knowledge is valuable, it can only be used to achieve a competitive advantage when integrated with the organization's capabilities. In this context, a competitive advantage can only be achieved with both the valuable specialist's knowledge and the rare organization's capabilities. To sustain this competitive advantage, the knowledge must also be broad enough in scope to achieve a higher-level

integration across a broad context of the organization in an effort to sustain its inimitability (Grant, 1996).

This view of the specialized knowledge of human resources within an organization contributing to a competitive advantage has been amplified in the current post-industrial knowledge-based economy particularly with its heavy reliance on Information Technology (particularly networking & digitization) (Grant, 2002).

2.3.2 Strategic human resource management

Within the strategic human resource management field, scholars focus on "the pattern of planned human resource deployments and activities intended to enable the firm to achieve its goals" (Wright & McMahan, 1992, p. 298). This requires linking the HRM practices to the strategic management processes (vertical fit). It also suggests a horizontal fit with the other human resource activities through a defined plan.

"Thus, the key role of strategic HRM is to ensure fit among a subset of strategically relevant variables while simultaneously seeking to build generic organizational capabilities that can be applied toward both discovering and implementing a variety of diverse strategic initiatives" (Wright & Snell, 1998, p. 767). Although resource mobility (which is implicit in the ability to acquire human resources on the open market) would normally negate the ability to achieve a sustainable competitive advantage, acquiring human resources to fulfill the strategic needs of the organization allows it to reap the benefits of skills needed by the organization that were developed elsewhere while keeping them within the organization. Consequently, the acquiring organization realizes the immediate benefits of being able to utilize the skills acquired while not having the expense of otherwise necessary training (particularly if those skills were not already present within the organization) (Lepak & Snell, 1999). When these acquired resources are complementary to the organization's existing resources and capabilities, they can then become a source of a competitive advantage (Lepak & Snell, 1999; Barney, 1991; Wright, McMahan, & McWilliams, 1994) particularly when they are integrated into an organization's strategy (Wright, McMahan, & McWilliams, 1994).

2.3.3 Strategic hiring of computing personnel

Even in the context of alliances, organizations need to duplicate some of the knowledge of the overall system integrator in order to efficiently integrate across multiple areas of knowledge (Grant, 2002). This is particularly true in areas where one organization may be specializing in a particular area of expertise (e.g., environmental sustainability) and is considered the system integrator for development of that capability within another organization. The subordinated organization for this capability must have knowledge workers with the ability to communicate effectively with the system integrator in order to efficiently integrate their capabilities.

Information Technology is at the heart of an organization's environmental efforts (in a survey, 89% of responding organizations feel that IT is likely to have a significant role in reducing the organization's environmental footprint and 96% are preparing for a Green IT strategy (Symantec Corporation, 2009)). Banerjee (2002) likewise recognized the importance of the use of science and technology to resolve environmental problems utilizing a "technocentric" paradigm. One of the things that differentiates information systems is that they can facilitate significant changes to the processes utilized by organizations (Aken, 2008).

Understanding what skills are needed within computing professions has been an important topic in research since the 1980's. Archer (1983) utilized a survey administered to organizations to determine what skills and coursework were needed for Computer Science graduates. Subsequent similar studies have tracked and extended this research (Trauth, Farwell, & Lee, 1993; Aken & Michalisin, 2007). A different approach was utilized by Athey & Plotnicki (1988) who examined skills listed in job advertisements for IT positions from various newspapers. Litecky, et al (1992), expanded on Athey & Plognicki's research by applying a more

systematic sampling of job ads from major metropolitan markets throughout the US (Gallivan, Truex, & Kvasny, 2004; Prabhakar, Litecky, & Arnett, 2005; Litecky, Prabhakar, & Arnett, 2008). Methods used by other researchers include using interviews and surveys and have focused on the importance of managerial and technical skills in computing jobs (Noll & Wilkins, 2002; Goles, Hawk, & Kaiser, 2008). This research methodically identifies the skills as defined by what employers actually have listed in their computing job ads and classifies these collections of skills to make this myriad of data meaningful and accessible to the general public (Chen-Chuan Chang, He, & Zhang, 2004; Litecky, Aken, Ahmad, & Nelson, 2010).

2.4 Hypothesis Development

Based upon the previous research, certain conclusions can be drawn about the relationships between an organization's environmental posturing, its environmental performance, and its hiring practices.

2.4.1 I think I'm green, therefore I am

A corporate social agenda works on a progression from doing no harm through updating the corporate strategy to improve social conditions on a global scale (see Figure 1: Model of a Corporate Social Agenda). "It is through strategic CSR [Corporate Social Responsibility] that the company will make the most significant social impact and reap the greatest business benefits" (Porter & Kramer, 2006, p. 7).

Corporate Involvement in Society: A Strategic Approach

Generic Social Impacts	Value Chain Social Impacts	Social Dimensions of Competitive Context
Good Citizenship	Mitigate harm from value chain activities	Strategic philanthropy that leverages capabilities to improve salient areas of competitive context
Responsive CSR	Transform value-chain activities to benefit society while enforcing strategy	Strategic CSR

Figure 1: Model of a Corporate Social Agenda (Porter & Kramer, 2006)

In this model, there are two primary strategies for implementing a strategy of Corporate Social Responsibility (CSR): Responsive CSR and Strategic CSR. These strategies are not mutually exclusive (an organization can work towards implementing both) and both of these strategies have an impact on the value chain from mitigating harm (Responsive CSR) through transforming the value-chain to benefit society.

Given the significant social gains and potential performance improvements, many organizations at least profess to follow an environmental strategy. According to a Symantec survey (2009), 86% of surveyed organizations indicated a desire to qualify as being "green" as being very important. 67% responded that improving the company's reputation was important.

Sustainable development and social responsibility are the current buzzwords in the corporate world. Not surprisingly, therefore, the websites, annual reports, and brochures of top international organizations are full of carefully crafted accounts of 'sustainable' and 'socially responsible' projects such as poverty alleviation, protection of human rights, and the use of the four Rs (Reduce, Re-use, Recycle, and Re-think) (Munshi & Kurian, 2005).

The abundance of environmental sustainability claims, whether valid or not, has made it difficult for stakeholders to differentiate between firms with an actual environmental strategy and those that are just taking advantage of the renewed public interest

in the global ecology. As a result of attempts by some organizations to mislead stakeholders about their environmental practices or the environmental benefits of particular products or services (known as "greenwashing"), the desired impact of these communications has been diminished even for companies that are fulfilling their pledges (Parguel, Benoit-Moreau, & Larceneux, 2009).

Although there is evidence to suggest that statements regarding environmental strategy in various corporate assertions may be hyperbole and a form of "greenwashing" (Parguel, Benoit-Moreau, & Larceneux, 2009), empirical testing in other research has indicated validity in such statements regarding corporate policy (Parguel, Benoit-Moreau, & Larceneux, 2009; Bowman, 1978; D'Aveni & MacMillan, 1990; Michalisin, 1999) and that top management teams' assertions in annual report texts are manifestations of the values that are deemed important by top management (Michalisin, 1999). Previous studies have also found that socially responsive organizations are more likely to talk more about social responsibility in their Annual Report Text than less responsive firms (Bowman, 1978). Furthermore, it has been found that companies that are proactive in environmental issues utilize self-reported managerial perceptions (Banerjee, 2002). Presuming that environmentally proactive organizations will achieve at least some of their goals, I propose the following hypotheses:

H 1: There is a positive relationship between an organization's environmental posturing and its environmental performance.

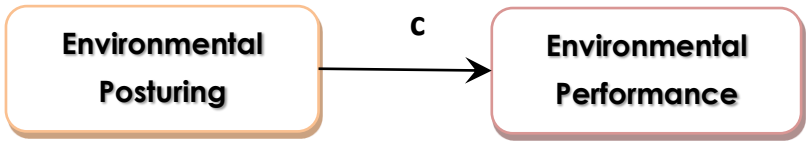

Figure 2: Direct Relationship between Independent and Dependent Variables

2.4.2 It's not easy being green – Hiring practices as mediators of performance

Being environmentally proactive can become a part of an organization's image and identity and can provide direction for the actions of its employees. Such an image can also influence HR policies which will impact job design, recruitment and hiring, as well as other HR support systems. Such HR policies can also improve productivity and attract top recruits who are looking for organizations practicing environmental stewardship (Russo & Fouts, 1997; Dechant & Altman, 1994).

The hiring practices of the firm, thusly, represent matching the requisite resources to an organization's environmental strategy. Not only, then, can performance suffer because organizations are gaining a reputation for "greenwashing" while not hiring employees with the appropriate skills to implement a Green IT strategy, but it may also be that the HRM function in the organization does not properly understand the strategy of the organization. Either way, it is expected that the results would be poorer environmental and financial performance if there is not a fit between an organization's environmental strategy and its hiring practices (Hitt, Bierman, Shimizu, & Kochhar, 2001).

Strategic fit also states that performance will suffer for organizations that behave differently than their strategy dictates. Whenever an organization exhibits a misfit between its environmental and its organizational context, performance will suffer (Zajac, Kraatz, & Bresser, 2000). Therefore, I propose the following hypotheses:

H 2: The relationship between environmental posturing and the organization's environmental performance is mediated by its environmental hiring practices.

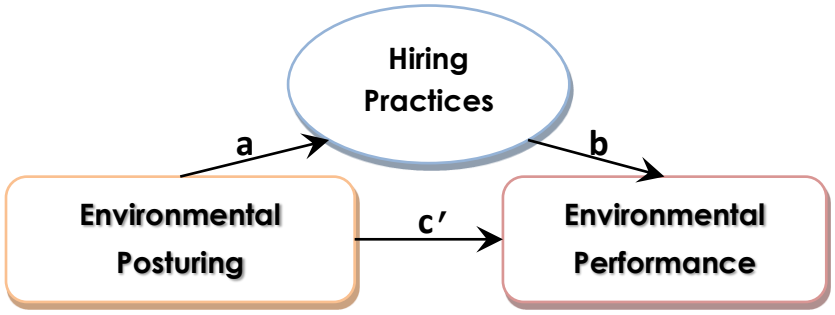

Figure 3: Mediation Effect of Hiring Practices on Environmental Posturing and Environmental Performance

Research Methodology

This section describes the research methodology undertaken for this research. Details are provided to understand the variables, how the data was gathered, how the variables were measured, and how the relationships between the variables were analyzed. First, I begin with a discussion of the population frame and the sample from which it was drawn.

3.1 Population Frame

The population frame for this study is publicly-traded organizations. To be selected for this study, an organization must exist in the independent ratings company Kinder, Lydenberg, Domini Research & Analytics, Inc.'s KLD STATS dataset which rates all organizations in the Russell 3000 index on various corporate social responsibility (CSR) criteria (Chatterji, Levine, & Toffel, 2009). Additionally, only organizations that have publicly posted at least ten job ads for personnel with computing degrees are included. The organization must also have its annual report text accessible for the period under empirical examination. The sample drawn from the population frame is discussed in section 4.2 on page 30.

3.2 Constructs

3.2.1 Environmental posturing

Integrating environmental issues into an organization's strategic plan is a key component of improved environmental performance (Banerjee, 2002). Previous research suggests that companies that are proactive environmentally have top management support involved in environmental issues, use internal and external reporting methods, and encourage environmental training and involvement from their employees (Menguc & Ozanne, 2005).

The environmental orientation of an organization has two dimensions: internal orientation which reflects managers' perceptions of environmental issues and external orientation which is reflected in the need to share these views with the stakeholders (Banerjee, 2002). Additionally, attribution theory proposes that the amount of effort put forth to indicate an environmental strategy indicates its inherent motives in carrying out that strategy (Parguel, Benoit-Moreau, & Larceneux, 2009).

Annual Reports are the primary communications mechanism between the organization's management and its stakeholders (Michalisin, 1999), and thus for purposes of this study environmental posturing were measured by analyzing the Annual Report Text (including the Letters to the Shareholders, Company Report, and Management Discussion and Analysis) of the organizations being studied. Extracting environmental statements from Annual Report Texts has also been utilized successfully in prior research (Al-Tuwaijri, Christensen, & Hughes II, 2004; Cho & Patten, 2007).

Components of annual reports typically contain a Letter to the Shareholders (LttS), Company Report, Management Discussion & Analysis, Financial Statements, and Footnotes (Michalisin, 1999). The LttS, Company Report, and Management Discussion & Analysis components provide the

primary source of data for this analysis (hereafter, Annual Report Text is referred to as ART).

While analyzing the text of annual reports does not tell us why particular aspects of the environment were mentioned, it does indicate that the authors were paying attention to it. Since the letters can be attributed to top managers and CEOs must sign them and are responsible for their accuracy, they can be assumed to have final authorization over their content. LttS have been seen as manifestations of the intent of the leaders of the organization and are good representations of the things that the leaders find important. They also reveal how much attention is paid to different components of its environment relative to other components (D'Aveni & MacMillan, 1990) (e.g., the frequency with which a topic is mentioned relative to other topics has significance).

Organizational communication research has successfully inquired into how organizations arise in the communications among members and develop nourishing organizational cultures. Content analysis of what is said and written within an organization provides the key to understanding that organization's reality (Krippendorff, 2004).

In Bowman's (1978) study of annual reports, he found that they can provide rich sources of information when analyzed using content analysis. For example, he found that companies that were successful in the computer industry had a stronger focus on adroitness in coping with their environment, customer orientation, international activity, and vertical integration than companies that were less successful. D'Aveni & MacMillan (1990) analyzed the LttS of the 1000 largest bankruptcies between 1972 and 1982 and found that surviving bankrupt companies had the same focus on the internal environment as they did on the external environment. Failing firms, however, focused mostly on the internal environment. Michalisin (1999) found that content analysis of innovation statements made in annual report text (ART) accurately reflected the innovation strategy of organizations. Michalisin and White (2001) compared emphasis on quality in annual reports to independent measures of quality across one hundred Fortune 500 and Service 500 firms and found that there was a strong, positive relationship.

The results of these studies indicate that assertions made in annual report texts accurately reflect the values, strategies, and beliefs that top management of the organization considers important and focuses their attention on. They are, therefore, an important resource for management research (particularly for variables that resist other forms of empirical testing). They also provide a rich data set for researchers in that they are accessible for a broad sample of organizations that are publicly traded (no issues regarding response rate) which improves the generalizability of the empirical results (Michalisin, 1999). Other areas in which study of ARTs has shown it can be fruitful is in the study or organizational culture and in testing the relationship between intangible resources and firm performance (Michalisin, 1999). Consequently, annual report texts offer relatively accurate reflections of the organizations' focus on different elements of their environment and the amount of emphasis placed on a particular topic in the ARTs is reflected in the strategy and the performance related to that topic. This makes them particularly useful in identifying the strength of environmental focus and strategies within an organization.

Content Analysis has been defined as "analysis to determine the meaning, purpose, or effect of any type of communication, as literature, newspapers, or broadcasts, by studying and evaluating the details, innuendoes, and implications of the content, recurrent themes, etc." (Random House, Inc., 2009, p. 1). Krippendorff (2004, p. 18) narrows that definition to describing content analysis as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use."

Content analysis came into vogue within the social sciences in the 1980's, but had been used by researchers since the 19th century. At that time, it required a significant amount of effort to collect,

transcribe, and code the textual data which made content analysis a labor-intensive, time-consuming activity. Content analysis has subsequently become an efficient means to conduct public opinion research, track markets, analyze politics, discover emerging trends, and study organizational theory (Krippendorff, 2004; Michalisin, 1999). As humans, we typically measure observed phenomena against particular standards to identify the kinds of phenomena that are being observed (identification/categorization), how good or bad the observed phenomena are (evaluations), or how close the phenomena approximate our expectations (judgments). Identifications are primarily concerned with what something is, what it is called, or to what category it belongs. In content analysis, this is the simplest task in that it seeks to determine if something has occurred, was said, or was written (Krippendorff, 2004). This type of observation requires the data to be encoded in a binary format: either it occurred or it didn't.

An index is a slightly more complicated variable that can be utilized within content analysis. Its significance is determined by its correlation with other phenomena of interest, not necessarily the verbatim meaning of the text being selected. Krippendorff (2004) refers to five types of indices, two of which are particularly germane to this analysis: The frequency with which a symbol, idea, reference, or topic occurs in the texts being analyzed is taken to indicate the importance of, attention to, or emphasis on that symbol, idea, reference, or topic.and the frequency of co-occurrence of multiple concepts (excluding those that have synonymous meanings) is taken to indicate the strength of associations between those concepts

Krippendorff (2004) also defines six steps to be followed when performing content analyses:

1. Unitizing: systematic distinguishing of segments of text of interest to an analysis.
2. Sampling: allows the analyst to economize on research efforts by limiting observations to a manageable subset of units.
3. Recording/coding: bridges the gap between unitized texts and someone's reading of them.
4. Reducing data to manageable representations: relying on established statistical techniques or other methods for summarizing or simplifying data.
5. Abductively inferring contextual phenomena: relying on analytical constructs or models of the chosen context as warrants.
6. Narrating the answer to the research question: relying on narrative traditions or discursive conventions established within the discipline of the content analyst. (Krippendorff, 2004).

One important concept to note in Krippendorff's content analysis process are the feedback loops that allow the researchers to revisit any of the steps based upon information uncovered during the analysis or problems that need to be addressed (information about the text's resistance to analysis). Consequently, the design is done iteratively. The content analyst compares initial inferences from a content analysis of text to the relevant observations of the context (e.g., Key Word in Context Analysis or KWIC (Michalisin, 1999)) and any discrepancies are used to incrementally change the appropriate parts of the analysis. This process eventually results in a best fit of the analysis techniques to the texts being analyzed (Krippendorff, 2004).

For the content analysis of the annual reports the units of text will be the following sections of the annual report: Letter to the Shareholder, Company Report, and Management Discussion & Analysis. The sample selected is drawn from those organizations that are publicly traded and are required to file annual reports (within the 10K Report) with the Securities and Exchange Commission.

For the Recording/Coding step, the instructions must contain everything needed to replicate the analysis somewhere else. The language used to record the data must also meet three criteria:

- Must be free of syntactical ambiguities (what the content analysts are looking for must be absolutely clear) and inconsistencies
- Must satisfy the requirements of the analytical techniques to be used (right types and ranges of variables)
- Must provide enough information to draw the appropriate inferences for the phenomena of interest (Krippendorff, 2004)

For the coding of the environmental statements made within the ARTs, I used a weighted value that was calculated as the number of environmental statements found relative to the size of the ART (Al-Tuwaijri, Christensen, & Hughes II, 2004). This controls for the size of the ART which varies substantially across organizations in the sample.

Computer software, however, can circumvent the first two criteria since it has no ambiguities (it records exactly and only what it is told) and can easily be programmed to ensure the correct format of data is recorded to support the analytical techniques to be used (Krippendorff, 2004; Michalisin, 1999). This research relied upon a custom computerized retrieval and content analysis application called Arachnid. Computerized content analysis applications have many advantages over manual, human-based, content analysis for the reasons above as well as the ability to analyze large amounts of data with perfect reliability (Krippendorff, 2004).

When using computers in content analysis, a methodological shift must occur. Instead of being concerned with the ability of human coders to be able to encode a large volume of text at a reasonable rate and with consistency, the content analyst must now be concerned with ensuring that the context of the terms being sought matches the meaning that is intended (Krippendorff, 2004). To overcome this obstacle, this research attempted to ensure that the terms sought have very discrete meanings. For example, the term "environment" may refer to a variety of things in different contexts. It could be referring to the economic environment, the working environment, the ecological environment, or any of a number of other meanings. Consequently, only terms and phrases with discrete meanings that are explicitly tied to the concepts sought are used. So, instead of searching for environment, a series of more specific phrases were utilized (e.g., "environmentally friendly", "environmental management system", etc.). This process subsequently eliminated false positives (Type I errors) at the expense of errors of omission (Type II errors).

The first place to begin creating the list of terms related to environmental strategy and Green IT was the academic and practitioner literature and textbooks (Michalisin, 1999). I first went to the literature to discover what terms were used to describe environmental issues, strategies, and processes. I then went to documents that were distributed by organizations relating to their environmental strategies and technologies to find relevant terms. I then redacted the list to remove those terms that frequently were used in contexts other than environmental concerns.

With the custom software application (Arachnid), the ability to discover matches of concepts is significantly more complex than a simple matching/searching algorithm. Because computers are only capable of determining whether a match of 1's and 0's has occurred during a basic search, spelling variations, word forms, capitalization, and synonyms would not normally be matched (e.g., if searching for the term "environmentally" using a simple search technique, occurrences of environmental, Environmentally, and ecologically would not be found). Arachnid performs several variations of root word analysis and lemmatization (what Krippendorff (2004) refers to as "computational content analyses"). One variation that is typically utilized in more complex Computer-Aided Text Analysis (CATA) systems is converting all terms in the source text and the search text to their root word form (e.g., environmentally would be converted to environment) prior to the count to be conducted. However, one of the issues with blind root word

conversions is that sometimes significant meaning can be lost (e.g., environmental almost always refers to the meaning of the term in the ecological sense, whereas environment is more frequently used in other contexts as was illustrated earlier). Therefore, Arachnid has the ability to tag the search terms so that they are only compared to the original text without converting it to the root word form.

A form of root word analysis that is not typically utilized in other CATA applications deals with word combinations (Krippendorff, 2004). For example, if the term "environmentally friendly" were one of the search terms and the source text had the hyphenated version of the term "environmentally-friendly", most CATA programs would not be able to detect a match. Commonly used phrases are also frequently concatenated together to form new word forms (e.g., EnvironmentallyFriendly) either purposefully or by accident which would likewise not be found as a match in most CATA software. Therefore, in the custom software application utilized for performing content analysis for this research, word phrases are searched for in the source text in several variations including as written (environmentally friendly), hyphenated (environmentally-friendly), concatenated (environmentallyfriendly), and underscored (environmentally_friendly). This is significantly more computationally intensive, but results in fewer Type II errors.

According to Krippendorff (2004, p. 313), "Validation provides compelling reasons for taking the results of scientific research seriously." There are several forms of validation that are utilized in content analysis research: Face validity, Social validity, Empirical (internal) validity, Content validity, Construct validity, and Criterion-related (instrument) validity (including Concurrent instrument validity and Predictive instrument validity). Krippendorff (2004) suggests three forms of validating evidence that relate specifically to content analysis: treatment justification (a form of empirical validity), abductive inference (a form of construct validity), and results justification (a form of criterion-related validity). Treatment justification relies on evidence concerning the degree to which the sample of texts accurately represents the phenomena it is supposed to represent. This can be attested to by ensuring a firm theoretical foundation for the selection of the appropriate texts and their subsequent recording. Abductive inference validation basically states that you can infer that the construct is valid if the relationship it is supposed to confirm is supported by the analysis. Results justification validation states that if the proposed relationships are significant, they are valid.

In this research the population of texts (Krippendorff, 2004) is all of the written and spoken texts on behalf of the organization being studied. I have selected a sample of the annual report text based upon prior research (Bowman, 1978; D'Aveni & MacMillan, 1990; Al-Tuwaijri, Christensen, & Hughes II, 2004; Michalisin, 1999) that thus supports the treatment justification evidence. Construct validity was ascertained by reviewing a sample of the output of the CATA application and verifying that it was appropriately cataloguing the phrases of interest (for both Type I and Type II errors) (Krippendorff, 2004; Michalisin, 1999). This process was done iteratively to improve the construct validity by tweaking the CATA parameters as necessary in order to achieve the desired validity (Krippendorff, 2004; Litecky, Aken, Ahmad, & Nelson, 2010; Michalisin, 1999)

3.2.2 Hiring practices

Since hiring practices are a key indicator of an organization's attempt to implement a corporate strategy and Information Technology is at the heart of an enterprise's environmental efforts (Guerci, Longoni, & Luzzini, 2016), this research focused on IT hiring practices as the measure of an organization's attempts to implement an environmental strategy.

An organization's Information Technology (IT) related environmental efforts often incorporate what has become known specifically as "Green IT" or "Green Computing." Murugesan (2008, p. 33) states that "Green IT is an economic as well as an environmental imperative." Previously, Green IT

was superfluous to most organizations. This, however, is no longer the case. Organizations are now looking for Green IT solutions for a variety of reasons. According to the most recent Symantec survey on Green IT (2009), at least 96% of companies are discussing Green IT, 52% are in the discussion or trial stages of implementation, while 45% have actually implemented a Green IT strategy. One of the reasons that organizations are seeking to implement Green IT is to cut costs through reduction of energy consumption (90%) and cooling costs (87%). However, organizations also expressed a desire from top management to qualify as being "green" (86%) and to improve their corporate image (67%). Many organizations also expressed an explicit desire to implement Green IT as a method of reducing their carbon footprint (74%). Therefore, I selected an organization's computer personnel hiring practices as the key indicator of its implementation of an environmental strategy.

For this research, job ads are extracted from job search websites (Monster, SimplyHired, HotJobs, Dice, CareerBuilder, and Indeed) and are filtered to retrieve only ads requiring IT degrees (e.g., Computer Science, Management Information Systems, and Information Technology). Over two million ads have been obtained by this method from the jobs advertised on the Internet since April, 2007. To collect and analyze these job ads, this study utilizes a web content mining technique previously described in the discussion of content analysis. This allows the software to automatically read large and diverse documents written in natural language and derive knowledge from them (Becerra-Fernandez, 2006). Data mining techniques such as this are generally utilized to "discover something new from the facts recorded in a database" (Glymour, Madigan, Pregibon, & Smyth, 1996, p. 35). To collect the data for the analysis of the job postings on websites, the author developed Arachnid to perform two primary functions:

1. Find all of the job postings for graduates in Computer Science (CS), Management of Information Systems (MIS), and Information Technology (IT) degree programs and store the text of the job ads.
2. Extract and store the skills and other significant attributes from the job ads (Zhang, Lakshmanan, & Zamar, 2004).

To find the job postings, I automated the task of performing a search on the Monster.com, HotJobs.com, CareerBuilder.com, Dice.com, SimplyHired.com, and Indeed.com websites looking for references to the phrases synonymous with Computer Science which also have references to degree synonyms (e.g., Bachelors, BS, Masters, BA, Degree, etc.). Likewise, the software performs other searches for references to Management Information Systems (and synonyms) combined with the degree synonyms and Information Technology combined with the degree synonyms. One issue related to the available search features of the online websites includes use of common abbreviations often used for these types of degree programs. For example, searching for "IS degree", returned job ads with the verb forms of "is", not just the ads for "Information System" degrees. Similar problems were associated with "IT degree." Consequently, errors of omission (Type II errors) are expected but previous analyses (Litecky, Aken, Ahmad, & Nelson, 2010) have shown that there is little difference between the excluded ads and the extracted ads. The searches have been automated to run daily to retrieve the appropriate listings. Duplicated listings are excluded.

Prior research (Prabhakar, Litecky, & Arnett, 2005; Aken & Michalisin, 2007), analysis of job ads, and interviews were used to construct an initial collection of skill terms. Skills that relate specifically to environmentally-oriented tasks were also added. Skills that could be used in common language were excluded from the search so that their importance as skills would not be exaggerated (Liu, Chin, & Ng, 2003) to reduce Type II errors. Information on the occurrences of these skills is stored in the database.

Within the context of the computing job ads, this technique was used to classify ads as either having

environmental skills as a part of the job description or not. The score for the Environmental Hiring Practices construct is the percentage of job ads placed by the organization that included environmental skills relative to the total number of job ads placed by that organization. Thus, the value for Environmental Hiring Practices ranges from zero to one with organizations that are placing a greater emphasis on hiring employees with environmental skills approaching a value of one.

3.2.3 Environmental performance

Since 1994, the independent ratings company Kinder, Lydenberg, Domini Research & Analytics, Inc. (KLD) has been evaluating corporations and disseminating this information through a proprietary database (Cho & Patten, 2007). KLD's environmental ratings system is one of the most widely used because it has been shown to capably predict environmental performance (Chatterji, Levine, & Toffel, 2009). One limitation of the KLD data is that it uses a proprietary research process in order to create its ratings on each of the items measured. More transparency in the creation of these values would lend even more credibility to the data (Chatterji & Levine, 2005).

KLD Research and Analytics creates yearly assessments of companies' corporate social responsibility performance in their KLD STATS (Statistical Tool for Analyzing Trends in Social and Environmental Performance) product. The KLD data is comprised of a series of ratings for items in Environment, Social, and Governance factors. There are eight groups of ratings that the KLD data is clustered into: Community, Corporate Governance, Diversity, Employee Relations, Environment, Human Rights, and Product. It also has data regarding a number of Controversial Business Issues. Within each group of data (other than the Controversial Business Issues), the items are further subdivided into Strengths and Concerns. Within the Environmental group of items, the KLD scores each company on the following items (KLD Research & Analytics, Inc., 2008, pp. 9-11):

Strengths

Beneficial Products and Services (ENV-str-A): The company derives substantial revenues from innovative remediation products, environmental services, or products that promote the efficient use of energy, or it has developed innovative products with environmental benefits. (The term "environmental service" does not include services with questionable environmental effects, such as landfills, incinerators, waste-to-energy plants, and deep injection wells.)

Pollution Prevention (ENV-str-B): The company has notably strong pollution prevention programs including both emissions reductions and toxic-use reduction programs.

Recycling (ENV-str-C): The company either is a substantial user of recycled materials as raw materials in its manufacturing processes, or a major factor in the recycling industry.

Clean Energy (ENV-str-D): The company has taken significant measures to reduce its impact on climate change and air pollution through use of renewable energy and clean fuels or through energy efficiency. The company has demonstrated a commitment to promoting climate-friendly policies and practices outside its own operations. KLD renamed the Alternative Fuels strength as Clean Energy Strength.

Management Systems (ENV-str-G): The company has demonstrated a superior commitment to management systems through ISO 14001 certification and other voluntary programs. This strength was first awarded in 2006.

Other Strength (ENV-str-X): The company has demonstrated a superior commitment to management systems, voluntary programs, or other environmentally proactive activities.

Concerns

Hazardous Waste (ENV-con-A): The company's liabilities for hazardous waste sites exceed $50 million, or the company has recently paid substantial fines or civil penalties for waste management violations.

Regulatory Problems (ENV-con-B): The company has recently paid substantial fines or civil penalties for violations of air, water, or other environmental regulations, or it has a pattern of regulatory controversies under the Clean Air Act, Clean Water Act or other major environmental regulations.

Ozone Depleting Chemicals (ENV-con-C): The company is among the top manufacturers of ozone depleting chemicals such as HCFCs, methyl chloroform, methylene chloride, or bromines.

Substantial Emissions (ENV-con-D): The company's legal emissions of toxic chemicals (as defined by and reported to the EPA) from individual plants into the air and water are among the highest of the companies followed by KLD.

Agricultural Chemicals (ENV-con-E): The company is a substantial producer of agricultural chemicals, i.e., pesticides or chemical fertilizers.

Climate Change (ENV-con-F): The company derives substantial revenues from the sale of coal or oil and its derivative fuel products, or the company derives substantial revenues indirectly from the combustion of coal or oil and its derivative fuel products. Such companies include electric utilities, transportation companies with fleets of vehicles, auto and truck manufacturers, and other transportation equipment companies. In 1999, KLD added the Climate Change Concern.

Other Concern (ENV-con-X): The company has been involved in an environmental controversy that is not covered by other KLD ratings. materials in its manufacturing processes, or a major factor in the recycling industry.

KLD STATS encodes the information for each of these items in a binary format. In this dataset, if an item is scored as a '1', then the organization met the criteria for that item (whether it is a positive or negative item). If an item is scored as a '0', then that organization did not meet KLD's criteria for that item. Basically a '1' for an item in a strengths sub-group would indicate a positive attribute, whereas a '1' for an item in a concerns sub-group would indicate a negative attribute.

Two of the items utilized in the KLD Environmental Concerns dataset are set to have a value of '1' if an organization belongs to a particular industry ("Agricultural Chemicals" and "Climate Change"). In order to eliminate any tautological relationships, these are excluded from the calculation of its environmental performance score.

For this research, I focus on three performance measures: the number of strengths (between 0 and 6), the number of concerns (between 0 and 5), and the number of strengths minus the number of concerns (the "net" environmental performance score is consequently between -5 and 6) (Fisher-Vanden & Thorburn, 2008). For the net environmental performance measure, the values are rescaled to scores between 0 and 11 with representative meanings of underperforming (causing environmental harm), outperforming (improving the environment), and neutral environmental performance.

Table 2: Classifications of Net Environmental Performance

Environmental Performance Score:	0 – 4	5	6 – 11
Classification:	Underperforming (Causing environmental harm)	Neutral (Nominal environmental impact)	Outperforming (Improving the environment)

3.3 Data Analyses

For the analyses of the relationships between the different variables in the theoretical model and the controls, multiple analysis techniques were utilized.

In the theoretical model the hiring practices (a **continuous variable) mediates the relationship** between the environmental posturing variable and

the environmental performance variable. Mediation occurs when the independent variable (environmental posturing) causes the mediator (hiring practices) which then causes the outcome (environmental performance) (Holmbeck, 1997) (see Figure 3 above).

In this simple mediation model, it has been theorized that the total effect of environmental posturing on environmental performance through the hiring practices of the organization is the sum of the direct and indirect effects, where c = c' + ab (Preacher & Hayes, 2008). To test the proposed mediating effect on the relationship between environmental posturing and environmental performance, I utilized the four-step technique established by Baron & Kenny (1986):

1. Show that environmental posturing is correlated with environmental performance using environmental performance as the criterion in a regression equation and environmental posturing as a predictor (estimate and test the path 'c'). This step should show that there is an effect that may be mediated (see Figure 2 above).
2. Show that environmental performance is correlated with hiring practices using hiring practices as the criterion in the regression equation and environmental performance as a predictor (estimate and test the path 'a'). This step essentially treats the mediator as if it were a dependent variable.
3. Show that hiring practices affects environmental performance using environmental performance as the criterion in a regression equation and environmental posturing and hiring practices as predictors (estimate and test the path 'b'). In this step, it is not sufficient just to correlate hiring practices with environmental performance; hiring practices and environmental performance may be correlated because they are both caused by environmental posturing. Thus, the independent variable must be controlled in establishing the effect of the mediator on the dependent variable.
4. To establish that hiring practices completely mediates the environmental posturing-environmental performance relationship, the effect of environmental posturing on environmental performance controlling for hiring practices (path c') should be zero. This basically estimates the effects from both steps 3 and 4 within in the same equation (Kenny, 2009).

The four conditions were tested with three multiple regression analyses (Holmbeck, 1997). There is no need for hierarchical or stepwise regressions in these analyses. If these conditions all hold in the directions that are predicted, then the effect of environmental posturing on environmental performance will be less in the fourth step than it was in the third step (Kenny, 2009). Full mediation occurs when environmental posturing has no effect when hiring practices are controlled for and partial mediation is indicated when steps one through three are met but the fourth is not (Baron & Kenny, 1986; Kenny, 2009). However, it has been suggested that differentiating between partial and complete mediation and applying statistical significance to this differentiation is unnecessary (Preacher & Hayes, 2008).

Data and Analysis

4.1 Introduction

This section discusses the requisite steps for testing the hypotheses set forth in Chapter 2. Specifically, I describe the sample used in the current research, the content analysis procedures, the operationalization of the constructs, and the results of the statistical tests using SPSS.

4.2 Sample

The sample for this research includes publicly-traded organizations that appeared in the KLD STATS datasets for 2008 and had posted ten or more computing job ads in 2007 and 2008. As a part of the job ad collection process, company names are extracted from the job ads and stored as a separate field in the database. Interestingly, 50,792 unique variations of company names were found in

924,844 of the job ads (about 54% of the job ads collected). Because many of these unique names were composed of different spellings or variations of the same company name, I went through a systematic process of matching these company names to the correct entities listed in the 2008 KLD dataset (See Table 3: Sample Company Names from Job Ads).

Table 3: Sample Company Names from Job Ads

Company Name extracted from Jobs Database	Company Name from KLD STATS
Adobe	Adobe Systems Incorporated
Adobe ( )	Adobe Systems Incorporated
Adobe Systems	Adobe Systems Incorporated
Adobe Systems ( )	Adobe Systems Incorporated
Adobe Systems Incorporated	Adobe Systems Incorporated
Adobe United States	Adobe Systems Incorporated
Adobe United States-California, San Jose	Adobe Systems Incorporated
Adobe United States-Washington, Seattle	Adobe Systems Incorporated

This resulted in matches of 1,883 company names from the job ads to the KLD dataset. Of this set of companies, 1,012 had placed 10 or more job ads.

Environmental Posturing was operationalized using content analysis of the 2007 Annual Report Texts (ARTs). Of the 1,012 companies, 947 had Annual Reports which could be downloaded through Mergent Online. Thus, the study was based upon the 853 organizations which met each of the criteria noted above (in the KLD STATS data set and which had placed 10 or more job ads which had been captured) and did not have any other missing data required for the subsequent analyses.

4.3 Variable Measurements

This section describes the data collection process and the calculations needed to operationalize the variables in ways that facilitate the testing of the hypotheses set forth in the current research.

4.3.1 Content analysis

As was previously stated, content analysis was utilized to measure the Environmental Posturing and the Hiring Practices constructs. The data being analyzed includes the Annual Report Texts (ARTs) from the year 2007 and the computing job ads collected between April 2007 (the first date from which data is available) through 2008. A computer program developed by the author and written in PHP was used to perform the data collection and content analysis. A relational database management system (MySQL) was used as the data repository for all of the source and extracted information. This section describes the sequence of content analysis procedures that were followed, including validation testing.

An initial set of 127 eco-environmentally-oriented terms was created by two doctoral students and a faculty member based upon their extant knowledge in the domain. This list was augmented by academic and practitioner literature (Hart, 1995; Reid & Toffel, 2009; Symantec Corporation, 2009; Banerjee, 2002; Aragon-Correa, Hurtado-Torres, Sharma, & Garcia-Morales, 2008), textbooks (Callan & Thomas, 2010; Willard, 2002; Lawrence & Weber, 2008), and the Internet which added another 154 terms.

A data dictionary (complete list of words occurring in the target text) was created by the custom software from the Annual Report Texts (ARTs) along with their frequencies to further complete the environmental keyword list (Michalisin, 1999). The following steps were taken to extract the environmentally-oriented terms from the ARTs to build the data dictionary.

1. ARTs downloaded in PDF format and converted to text.
2. ARTs stored in MySQL database along with the company which submitted the annual report, the date it was submitted, the number of words found, the number of characters found, and the number of sentences found.
3. ARTs converted to lower case.

4. All sequences of alphabetic characters beginning and ending along a word boundary (whitespace, certain punctuation, beginning of line, end of line) were extracted as 'words' along with their frequency and distribution (number of files in which they appeared). Hyphenated words were kept together. This resulted in 382,672 unique 'words' which were extracted.

Table 4: Sample of Data Dictionary

Word_id	Term	Length	Occurrences	Files
6773	abandon	7	831	458
8951	abandoned	9	2797	962
121620	abandonedfacility	17	11	5
121598	abandoned-facility	18	24	5
169185	abandonfirstenergy	18	2	2
17964	abandoning	10	126	83
8952	abandonment	11	2235	719

5. 20,137 long 'words' (50 or more characters) and short 'words' (2 or fewer characters) were eliminated (because of the PDF conversion process, some garbage text was produced which resulted in the long 'words').
6. Based upon the previous environmental term keyword list, certain environmentally-oriented common word components were extracted (bio, carbon, clean, climat, conserve, eco, efficien, electr, energy, env, forest, fuel, geo, green, hybrid, hydro, natur, pollut, power, recycle, reduc, reus, social, solar, sustain, therm, toxic, wast).
7. The data dictionary was then scanned for occurrences of these word components resulting in 11,587 words to be manually examined.
8. Unfamiliar terms were looked up in Google & the Wikipedia to determine if they were environmentally-oriented and in what way.

This process resulted in the addition of 220 words and phrases being added to the environmental terms list, resulting in a total of 501 pre-validated terms. Inclusion of each of these words and phrases in the subsequent analyses was determined through a rigorous, systematic validation process commonly known as Keyword In Context (KWIC) analysis (Krippendorff, 2004; Michalisin, 1999).

After the initial keyword selection and term extraction from the target texts, the utilization of these terms was validated utilizing the KWIC process. In this process, the terms and the surrounding textual unit were extracted from the text in which they occurred. For this research, the sentence was the unit of analysis for validating whether key word combinations were environmentally oriented in a manner consistent with the logic embodied in the NRBV. These extracted contextual usages of the terms were then validated using subject matter experts with specific rules which are previously and explicitly defined. The rules were defined with enough specificity that the results of the analysis could be replicable by reviewers with comparable backgrounds (Krippendorff, 2004).

For validating the terms in the Annual Report Texts (ART), the primary concern was determining from the context whether the term was making a statement about an environmental issue relative to the organization. Because some terms may have been stated in a positive or negative context, the reviewers were also asked to specify if the terms were used in a negative way. Additionally, if other environmentally-oriented terms were found in proximity to the terms being validated and were found to be highly valid, they were added to subsequent KWIC analyses, which helped to ensure the completeness of key words and key word combinations.

For key word and key word combinations comprising the KWIC list, ten sentences containing the key word or key word combinations were

randomly selected by the software. When fewer than ten occurrences of a key word or key word combination existed in the ARTs, then all of the sentences containing the key word or key word combinations were selected. The sentences were put into a CSV (Comma Separated Values) file along with the original text of the environmental term, the number of occurrences of the term, and columns for the reviewer to select whether the term was valid, negative, and whether to include newly identified key words and key word combinations. The CSV file was then imported into Excel where dropdown menus for the valid and negative columns were created for each record. 103 keywords were not found in any of the ARTs which resulted in their automatic elimination from further analysis.

Table 5: Sample of KWIC Analysis Validation Form

Number Found	New Terms	Environmental Term	Valid	Sentence
25	low carbon	**environmental leadership**	Yes	As the nation's largest nuclear generator, Exelon is well positioned to provide environmental leadership in a low-carbon energy future.
25		**environmental leadership**	Yes	Our Health, Safety and Environment group has several programs in place to maintain environmental leadership and to prevent the occurrence of environmental contamination.
25		**environmental leadership**	Yes	Our environmental leadership strategy is designed to meet customer and policy maker expectations while creating shareholder value.
25		**environmental leadership**	Yes	Through our environmental leadership strategy, we are well-positioned to meet the challenges of potential future climate change regulation, comply with the renewable energy mandates and take advantage of the clean energy incentives created by policy makers in the states in which we operate.
25		**environmental leadership**	Yes	In 2007, a partnership involving Chrysler LLC and UpstreamSM received the Environmental Leadership Award (ELA), Chrysler's highest level of recognition for environmental achievement and excellence among all its employees and vendors.

For the first validation round, 3574 sample sentence records were extracted and initial validation was performed by a Ph. D. student. If more than two sentences with the same term to be validated (where ten sentences were found) were marked as invalid given the above rules, the term was eliminated. Likewise, if any invalid sentence was found when there were less than ten sentences for that term, then the term was eliminated. Additionally, if there were a mixture of positive and negative uses of the term with less than 80% consistency (e.g., the term was used positively 7 times and negatively 3 times), the term was also eliminated. This resulted in a validated term list where the terms were used in least an 80% consistent environmental context. The initial KWIC analysis of the ART terms found 32 new terms and eliminated 124 terms. After the addition of the new terms and removal of the invalid terms (leaving 306 keywords), a new random sample of five sentences per term was created (resulting in 1094 validation sentences). The new KWIC sample was independently evaluated by a Ph. D. student and a faculty member with the same rules as the previous sample. A third Ph. D. student was used as a tie-breaker when disagreement on the evaluation of any sentence occurred. As a result of this round of analysis, seven more terms were eliminated and no new terms were added. This left 299 validated terms to be used in the subsequent analysis of the ARTs.

A similar process of validating the environmental key word and key word combinations was performed using the textual data in the job ads. However, it is not uncommon for job ads to make statements about an organization (e.g., its philosophy or benefits) before discussing the position they seek to fill. As such, I also needed to determine whether the environmental term related to the firm or the IT position in the ad.

An additional feature was incorporated into the Excel spreadsheet for validating key words and key word combinations in job ads: A field which provided a link to the full text of the job ad was added. This was provided because many of the terms in the job ads could be displayed with nominal context within the surrounding sentence (e.g., a bulleted list of responsibilities for the applicant) and it enhanced the validity testing of the key word or key word combinations in the job ad.

After the initial first-round analysis of ten random sentences containing the keywords within the job ads, 404 keywords were eliminated because they did not occur within the job ads and 59 were eliminated because they did not meet the specified criteria. In most cases when the keywords did not meet the specified criteria, the environmental term was being used within the job ad to describe the company or its benefits and was not specifically related to the function of the job. This left 70 keywords for the second round of analysis. None of the keywords were utilized within a negative environmental context.

The second round of validation also used five randomly selected sentences which were independently evaluated by a Ph. D. student and a faculty member with a second Ph. D. student acting as a tie-breaker. This round of validation resulted in the additional removal of two keywords and no additional new keywords. Consequently, 68 validated keywords were utilized for the subsequent analysis of the job ads.

D'Aveni & MacMillan (1990) stated that when performing Content Analysis, the weighting of the scores derived should ensure that the scores are relative to the other components of the text being analyzed. One method of determining the weighted value is to compare the frequency that a topic is mentioned relative to other attributes of the text. All of the methods used for calculating the Content Analysis-derived values incorporated this basic precept.

Because the Annual Report Texts contained positive as well as negative statements regarding environmental issues, one method of calculating the Environmental Posturing score was to subtract the occurrences of negative statements from the occurrences of positive statements. This was consistent with the method of calculating the Environmental Performance score which subtracted the KLD Environmental Concerns from the Environmental Strengths. This method of calculating the Environmental Posturing score resulted in some companies having negative values (with a range of values between -266 and 746). However, because the job ads only contained environmental statements of a positive nature, an alternative method of calculating the Environmental Posturing score was to calculate the positive environmental statements as a ratio to the size of the ART (D'Aveni & MacMillan, 1990).

For the job ads, each ad was binary coded by the software as either having an environmental component or not. For each organization included in the study, the Hiring Practices variable was calculated as the percentage of all of the job ads in the dataset that had an environmental component (e.g., if Company A had placed 25 job ads and 5 of them had an environmental component related to the job, then its Hiring Practices value would be 0.20).

4.3.2 Environmental performance

Because the job ads only contained positive statements regarding environmental activities, two measures of Environmental Performance (Environmental Strengths and Overall Environmental scores) were evaluated. Equally important, recent literature has indicated that combining the environmental strengths and

concerns (weaknesses) data from within the KLD STATS dataset may not be statistically valid because the two groups of data (environmental strengths and concerns) lack convergent validity (Mattingly & Berman, 2006; Chatterji, Levine, & Toffel, 2007; Chatterji, Levine, & Toffel, 2009) and recommend using only the KLD environmental strengths metrics in computing Environmental Performance. For these reasons, I added the KLD STATS attributes for Environmental Strengths in deriving each firm's Environmental Performance in the current research. The descriptive statistics for Environmental Posturing, Hiring Practices, and Environmental Performance are summarized in Table 6 below.

Table 6: Descriptive Statistics for Environmental Posturing, Hiring Practices, and Environmental Performance

	Range	Minimum	Maximum	Mean		Std. Deviation
				Statistic	Std. Error	
Environmental Posturing Scores for 2007 with Negative Keywords	1012	-266	746	6.78	1.448	42.295
Environmental Posturing Scores for 2007 As a Ratio to Size of ARTs	.17943	.000	.17943	.00425	.00045	.01316
Environmental Hiring Practices	1.000	.000	1.000	.03662	.00429	.12523
Overall Environmental Performance Score for 2008	8	1	9	5.04	.026	.749
Environmental Strengths Score for 2008	4	0	4	.30	.025	.717
Valid N (listwise)	853					

4.4 Results

This section discusses the results of the analyses utilized in the study with both the proposed methods for operationalizing the constructs as well as the revised methods, based on the rationale previously described.

Tests of the assumptions for utilizing regression analyses were performed on each of the variables as well as the relationships among the variables. Although there were non-normal distributions of the data for some of the variables (primarily resulting from large numbers of valid measurements of zero (e.g., Environmental Strengths, Hiring Practices)) and attempts to normalize the data were unsuccessful, violations of the normality assumption "will have a negligible effect at large sample sizes" (Hair, Black, Babin, Anderson, & Tatham, 2006, p. 80). According to Hair, et al. (2006), a large sample would be one that included 200 or more observations. As such, with 853 observations, less than normally distributed data among some of the variables is thus not problematic in utilizing regression analysis to perform tests of the models and hypotheses. In fact, current research informs us that analytical techniques of the type used in the current research specifically state that normality assumptions need not be established for the tests to return valid results (Preacher & Hayes, 2008) and thus normalization of the data is not recommended when large samples are employed, as is the case in the current study (Goh & Yap, 2009). Statistical and graphical analyses performed in this research, as detailed later in this section, show that the other assumptions underlying the requisite statistical models needed to perform the empirical tests have not been violated.

The following sections are organized as follows. First, I show the correlations between the different variables. Next, I describe the statistical techniques used to test the relationships between Environmental Posturing, Environmental Performance, and Environmental Hiring Practices (Hypotheses 1 and 2) which are shown in Figure 3.

4.4.1 Correlations

Table 7 shows the correlations between all of the variables (with the proposed methods of calculating the values along with revisions to the calculation of the variables). The correlations lend support for the hypotheses (though not definitive support), show interesting significant results among variables, show interesting findings that certain relationships are not significant, and provide evidence of a lack of multicollinearity.

In the correlation table, interactions between variables which are utilized for the subsequent analyses have been underlined.

Table 7: Correlation Matrix

Variable	Environmental Posturing with Negative Keywords	Environmental Posturing as a Ratio	Environmental Hiring Practices	Overall Environmental	Environment
2007 Environmental Posturing with Negative Keywords	1				
2007 Environmental Posturing as a Ratio	0.713**	1			
Environmental Hiring Practices	0.245**	**0.305****	1		
Overall Environmental Performance for 2008	0.138**	0.115**	0.065	1	
Environmental Strengths for 2008	0.214**	**0.376****	**0.225****	0.522**	1
** *	Significant at p < 0.01 Significant at p < 0.05				

4.4.2 Mediating effect of hiring practices

The longstanding test for mediating effects was established by Baron & Kenny (1986) which required a three-step process for determining mediation. Although it is still widely utilized in research today, other methods for testing for mediation have subsequently been developed. Most notable of these later methods are those established by Preacher & Hayes (2008). One of the benefits of the methods proposed by Preacher & Hayes is that certain preconditions for mediation testing are no longer necessary. With the new methods, normality of the data is also no longer a prerequisite and statistically-significant positive correlations among each of the variables in the model is not a necessity.

In Baron & Kenny's (1986) model, a precondition of testing for mediation is that significant and positive correlations must exist between the IV and the MV, the MV and the DV, and the IV and the DV. As can be seen in Table 7, there is no significant relationship between Environmental Hiring Practices (the Mediator) and Overall Environmental Performance (the potential Dependent Variable). However, the Environmental Hiring Practices did not include negative (or concerning) statements regarding environmental issues while the Overall Environmental Performance variable is the result positive environmental attributes minus negative environmental attributes. Arguably, a more valid test of the MV and the DV is to compute Environmental Performance using only the strength measures included in the KLD STATS data. This logic is consistent with the recent research (Mattingly & Berman, 2006; Chatterji, Levine, & Toffel, 2007; Chatterji, Levine, & Toffel, 2009) which has shown that a composite of just the KLD strength measures is a better proxy of environmental performance than the net (strengths minus concerns) measure used in previous research. My findings support this logic. The correlation between Environmental Hiring Practices and Environmental Strengths is positive and highly significant ($p<0.01$), while the correlation between the Overall Environmental Score and Environmental Hiring Practices is insignificant.

Similarly, if the composite KLD strength measure is a superior proxy of environmental performance, then one could extend the same logic for using an Environmental Posturing Ratio that only includes positive environmental statements. This is consistent with previous validation tests of company ARTs, which found that greater emphasis in the ART on positive activities such as innovation and quality had significant, positive associations with independent measures of such attributes (Michalisin, Karau, & Tangpong, 2004; Michalisin, 1999). In the current research, I anticipate that a significant positive relationship exists between the top management teams' positive environmental posturing and its organization's environmental performance strengths. Indeed, the correlation between the Environmental Posturing Ratio and Environmental Strengths (r=0.376, p<.01) is stronger than it is to the Overall Environmental Performance (r=0.115, p<.01) as shown in Table 7. This is also lends support for Hypothesis 1.

The significant positive correlations, using the prescribed measurements discussed above for assessing whether the preconditions for testing mediation have been met are highlighted and underlined in Table 7. As shown, significant correlations exist between the IV and the MV (r=0.305, p<0.01), the MV and the DV (r=.225, p<0.01), and the IV and the DV (r=0.376, p<0.01).

Using the methodology of testing for mediation developed by Preacher & Hayes (2008), multiple mediators can easily be assessed (although only one is necessary for this research project). Additionally, scripts are available in SPSS to test for this relationship in a single step (Hayes, 2010) which not only simplifies the process, but enables a clearer interpretation of the results. Utilizing Environmental Posturing as the IV, Environmental Strengths as the DV, and Hiring Practices as the Mediator, the following results were generated:

```
Run MATRIX procedure:
*************************************************************************
Preacher and Hayes (2008) SPSS Macro for Multiple Mediation
Written by Andrew F. Hayes, The Ohio State University
http://www.comm.ohio-state.edu/ahayes/
*************************************************************************
Dependent, Independent, and Proposed Mediator Variables:
DV =   Env_Stre
IV =   ARTScore
MEDS = env_jobs
Sample size
      853
IV to Mediators (a paths)
            Coeff       se        t        p
env_jobs   2.9044    .3107    9.3471    .0000
Direct Effects of Mediators on DV (b paths)
            Coeff       se        t        p
env_jobs    .6992    .1897    3.6863    .0002
Total Effect of IV on DV (c' path)
            Coeff       se        t        p
ARTScore  20.4876    1.7320  11.8288    .0000
Direct Effect of IV on DV (c path)
            Coeff       se        t        p
ARTScore  18.4568    1.8054  10.2229    .0000
Model Summary for DV Model
     R-sq  Adj R-sq        F       df1       df2         p
    .1547    .1527   77.7902    2.0000  850.0000    .0000
*************************************************************************
        NORMAL THEORY TESTS FOR INDIRECT EFFECTS
```

```
Indirect Effects of IV on DV through Proposed Mediators (ab paths)
          Effect      se       Z       p
env_jobs  2.0308    .5915   3.4330   .0006
************************************************************************
        BOOTSTRAP RESULTS FOR INDIRECT EFFECTS
Indirect Effects of IV on DV through Proposed Mediators (ab paths)
           Data     Boot     Bias       SE
env_jobs  2.0308   2.0630   .0322    .9331
Bias Corrected and Accelerated Confidence Intervals
          Lower    Upper
env_jobs   .7109   4.4812
Bias Corrected Confidence Intervals
          Lower    Upper
env_jobs   .7417   4.6271
Percentile Confidence Intervals
          Lower    Upper
env_jobs   .6256   4.2493
************************************************************************
Level of Confidence for Confidence Intervals:
 95
Number of Bootstrap Resamples:
 5000

------ END MATRIX -----
```

Figure 4: Results of Preacher & Hayes Mediation Analysis

The Preacher and Hayes method produced a direct coefficient of 18.46 ($p<.001$) and the indirect coefficient of 20.4876 ($p<.001$). Preacher & Hayes also uses a bootstrap method to estimate the indirect effect of the mediation relationship. Bootstrapping is accomplished by taking a number of subsamples of the data and calculating the difference between the indirect effect and the direct effect (in the analysis of the data for this research, 5000 bootstrap samples were selected to conduct the mediation test). Unlike other methods of estimating the indirect effects, bootstrapping has no requirements regarding the shape of the sampling distribution (Preacher & Hayes, 2008). The 95% confidence intervals of the indirect effects did not pass through zero (see Figure 5 below), which lends support for Hypothesis 2 that Hiring Practices at least partially mediates the relationship between Environmental Posturing and Environmental Performance (Preacher & Hayes, 2008).

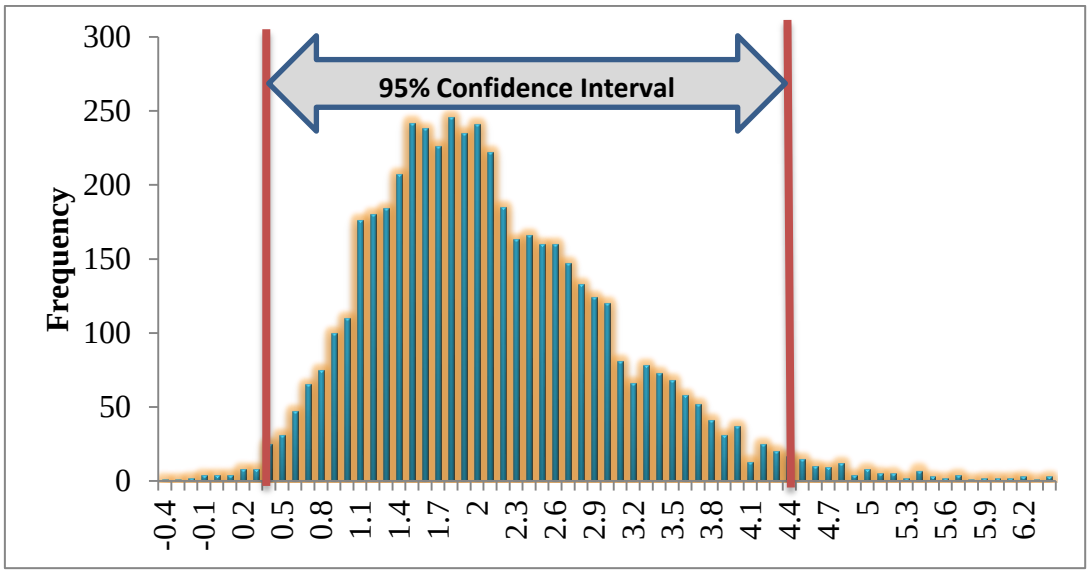

Figure 5: bootstrapped sampling distribution of indirect effect (c' – c)

Discussion and conclusions

The purpose of this study was to test the main prescription of the Natural Resource-Based View of the Firm: That implementing an environmentally-oriented strategy will result in improved environmental performance. Based on the logic embodied in the NRBV, organizations that are proactive in formulating and implementing environmental strategy can achieve a sustainable competitive advantage.

5.1 Specific Findings

The overall results of this study support the NRBV in that top management's environmental proactiveness and their investment in the requisite human capital (specifically in IT computing) to support environmental initiatives can lead to improved environmental performance. Moreover, to my knowledge, there are no published studies that show how human capital investments in IT computing personnel impact the firm's environmental performance.

5.1.1 Discussion of hypotheses' results

Table 8 and Figure 6 summarize the results of testing of the hypotheses

.

Table 8: Summary of Hypotheses' Results

H1	There is a positive relationship between an organization's environmental posturing and its environmental performance.	Supported
H2	The relationship between environmental posturing and the organization's environmental performance is mediated by its environmental hiring practices.	Supported

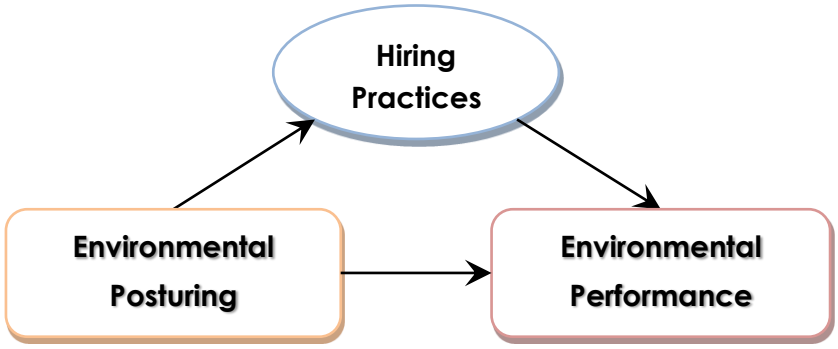

Figure 6: Summary of Results of Theoretical Model

Hypothesis 1 theorized a positive relationship between top management's Environmental Posturing in its Annual Report Text and its subsequent Environmental Performance. Because of the implied cause and effect nature of this relationship, the Annual Reports were used to measure the organization's Environmental Posturing and the KLD STATS dataset from a year later was used to measure Environmental Performance.

The analyses used methods of calculating the values of the variables based upon positive statements resulted in a strong and significant correlation between the Environmental Posturing and Environmental Performance scores (Pearson's

correlation of .376 with a significance < 0.01). Regressing Environmental Performance on Environmental Posturing also produced a significant model with an R^2 of .093 and a Beta for Environmental Posturing of 2.904 (standardized Beta of .305) with a significance < 0.01.

Because it has also been shown that what an organization presents in its annual report texts is a reflection of its strategy (Michalisin, 1999), this analysis also confirms one of the premises of the NRBV that there is a significant, positive relationship between an organization's environmental strategy and its environmental performance.

Hypothesis 2 theorized that an organization's Environmental Hiring Practices mediates the relationship between its Environmental Posturing and its Environmental Performance. The premise of this relationship is that unless an organization takes action to implement its strategy, its performance will not improve. Additionally, Strategic Human Resource Management literature states that in order for an organization to achieve its goals, its hiring practices must be congruent to its strategy (Wright & McMahan, 1992).

The analysis for Hypothesis 1 already showed that there was a significant relationship between Environmental Posturing and Environmental Performance. To show support for mediation of that relationship, the analyses must show that the relationship going through the mediator is stronger than the direct relationship. This study used Preacher & Hayes' (2008) tests for mediation which showed strong support for this relationship thus supporting Hypothesis 2.

One of the other interesting facets of this analysis is that the hiring practices that were studied focused only on computing personnel. This also confirms practitioner and academic literature (Symantec Corporation, 2009; Banerjee, 2002) which indicates that Information Technology is a fundamental component of environmental strategy implementation.

1.1.1 Greenwashing not present

Although what an organization presents in its annual report texts has been shown to be an accurate reflection of its strategy (Michalisin, 1999), the amount of public attention that has been paid to environmental issues over the past several years would seem to suggest an increase in the amount of disinformation about environmental issues promulgated by organizations (Lauer, 2003). However, with the strong and positive relationship between environmental posturing and environmental performance, it certainly appears through this analysis that environmental statements made in the ARTs are as accurate a reflection of its actual environmental strategy as other strategic statements made in the ARTs.

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